World Petroleum

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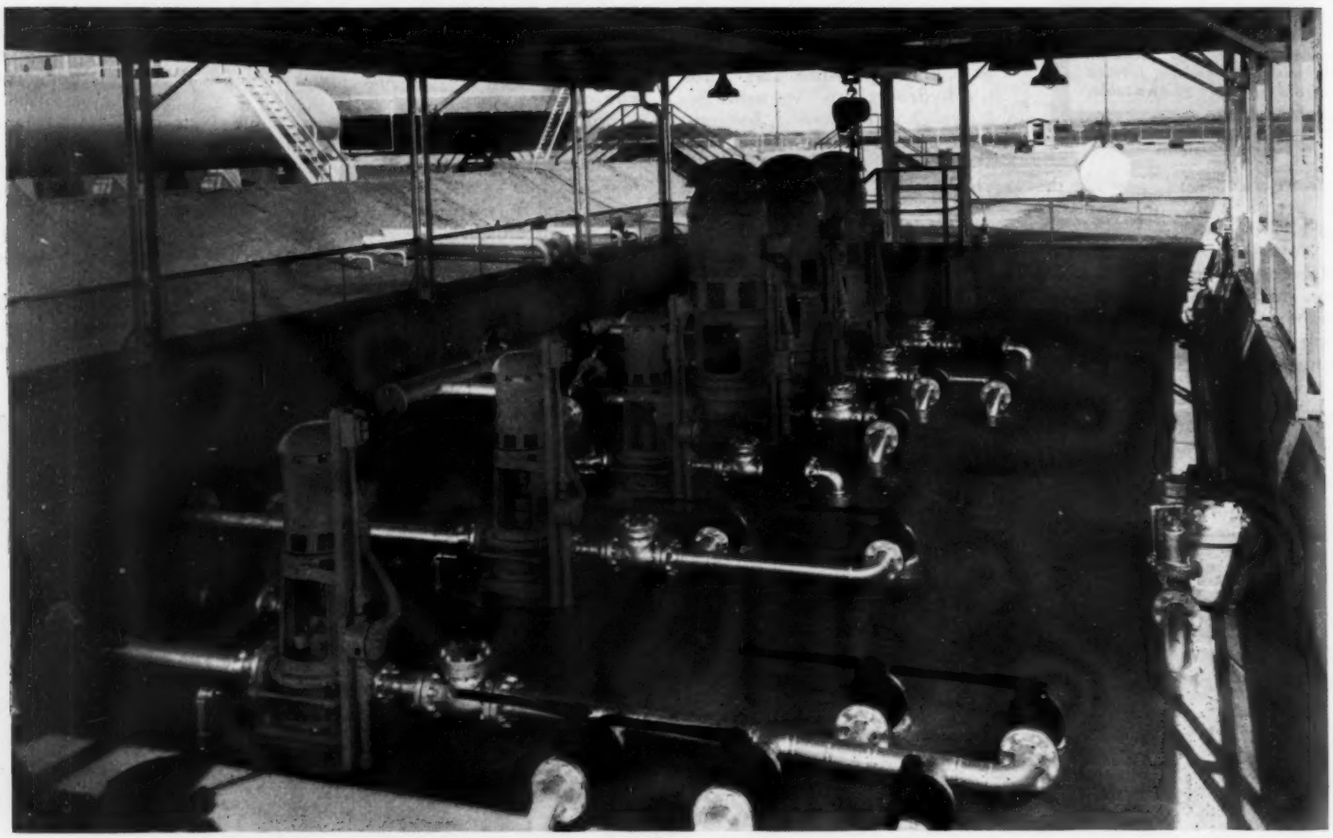
SEPTEMBER, 1950

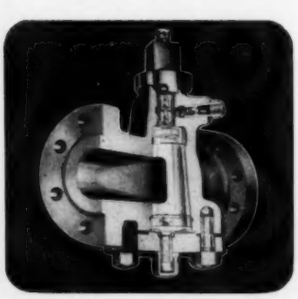
PRODUCTS HANDLING

. . . infinitely safer, when lines are controlled with Audco - Nordstrom valves



Audco-Nordstroms in a products pipe line pumping station.

● In handling petroleum products you first consider *safety*. That calls for ever-tight valves, free from freezing, free to turn easily, positively sealed around the ports regardless of line pressure. Note how perfectly the Audco Nordstrom design fits these specifications. The tapered plug is pressure lubricated, held tight on its unexposed seat by resilient means; the lubricated seat permits easy rotary turning of the plug, as contrasted to metal-to-metal unlubricated seats in common types; pressurized lubrication surrounds each port to prevent leakage; the plug can be hydraulically jacked when required.



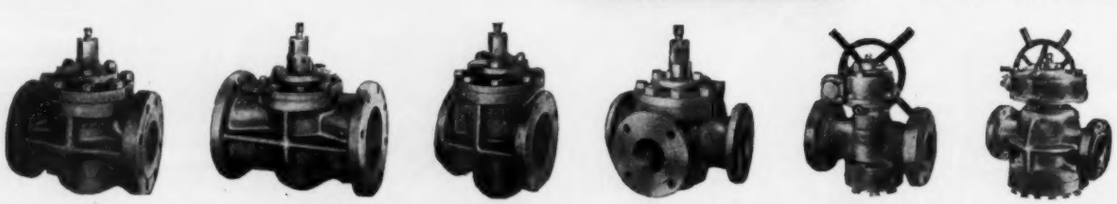
Put Audco-Nordstrom Valves to ANY test

You will find them to be tops in performance—and by far the most economical valves you have ever used. Successful operation of over 5,000,000 Audco-Nordstroms is proof of performance.

Now automatically lubricated

with

HYPERMATIC



Regular *Venturi* *Short Pattern* *Multiport* *Hypreseal* *Round Opening*

Audco-Nordstrom

BRITISH AMERICAN

LUBRICATED VALVES

Nordstrom Valve Division — **ROCKWELL MANUFACTURING CO.**
400 N. Lexington Ave., Pittsburgh 8, Pa.
Export: International Division, Rockwell Manufacturing Co., 7701 Empire State Bldg., New York 1, N. Y. Canadian Licensees: Peacock Bros., Ltd., Montreal, Quebec

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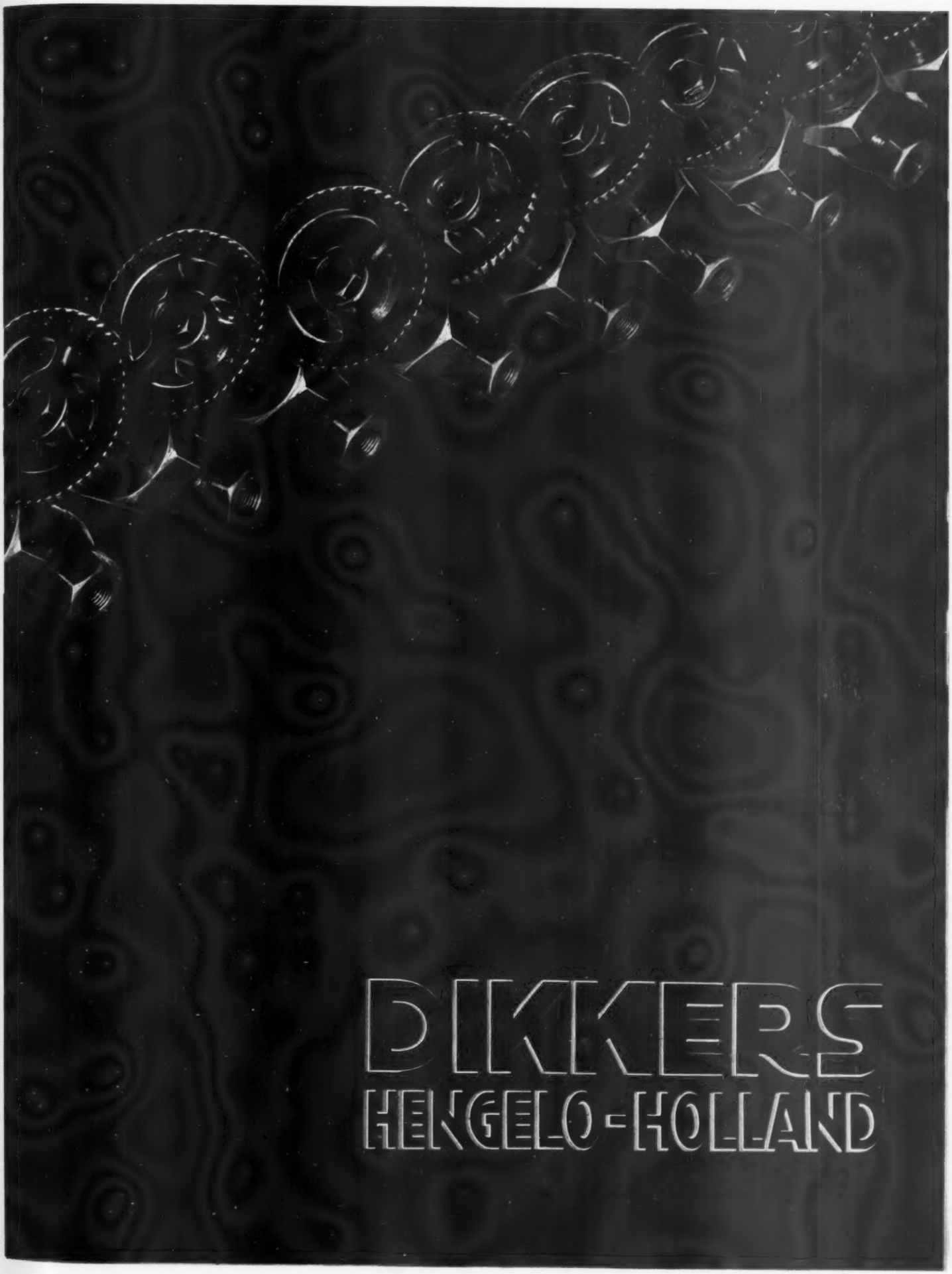
Overseas Agents located in South Africa, Australia, India, Trinidad, British West Africa. Finland, Norway, Sweden, France, Belgium, Switzerland, Italy, Roumania, Spain and Portugal.


BIKKERS
HENGELO - HOLLAND

First: *We Dig for Facts!*

With Williams Brothers Corp., pipe line construction is more than "diggin' a ditch" and "layin' pipe." The important facts of terrain, materials, supplies, adequate personnel and equipment are first carfully considered to assure each construction job of successful, quick and economical completion.

Williams Brothers have built many miles of pipe lines on three continents in the past 35 years. In executing these contracts, swamps, rivers, deserts and mountains have been conquered in all seasons and climates under all field conditions and each construction job was successfully completed.

Williams Brothers are ready, willing and able to build your pipe line anywhere on earth.

- **Trained Engineers**
- **Modern Equipment**
- **Skilled Personnel**

PIPE LINE ENGINEERS Williams Brothers Corp. CONTRACTORS

WILLIAMS BROTHERS CORP.

ENGINEERS — CONTRACTORS
Oil • Gas • Gasoline • Water
Pipe Lines and Pump Stations

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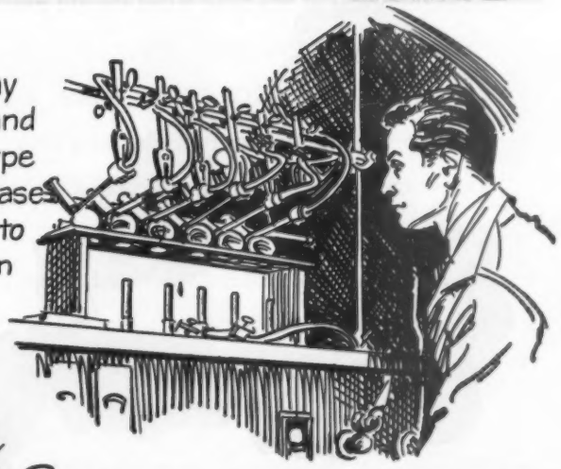
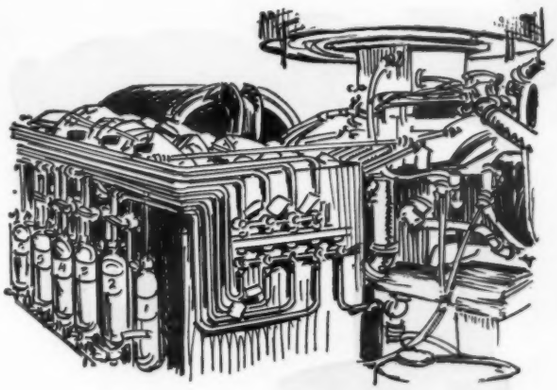
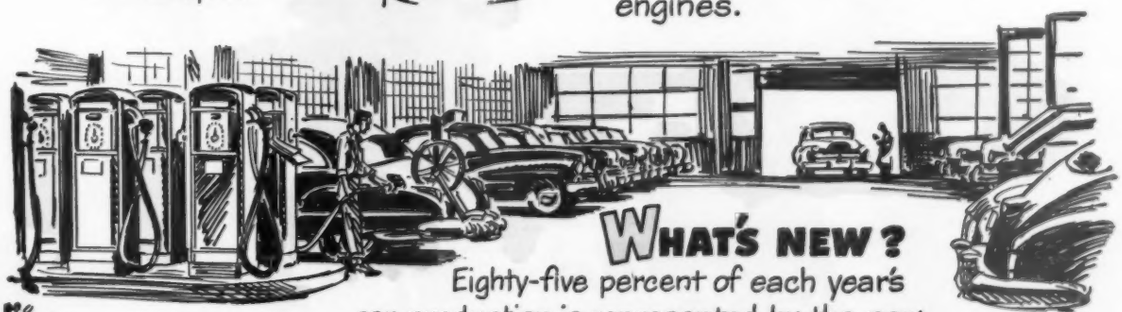
Speaking of Research... by ETHYL

ADDITIVES in the lubricating oil may affect results of engine tests on fuels and antiknocks. So Ethyl determines the type and amounts of additive present in crankcase oils... another of the careful steps taken to provide refiners with reliable information on the performance of engines and petroleum products.





SAMPLES OF EXHAUST GASES are taken from each port of an engine in research on the distribution of "Ethyl" antiknock fluid to the cylinders. This is one phase of the over-all research program designed to attain maximum effectiveness of "Ethyl" fluid in today's fuels and engines.



WHAT'S NEW? Eighty-five percent of each year's car production is represented by the new models road-tested by Ethyl to determine their fuel requirements and other information of interest to refiners

Over 400 specialists working full time on fuel and engine developments

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RESEARCH LABORATORIES
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Every Engineer...

Every engineer who is concerned with the pumping of fluids or gases should possess a copy of this Gland Service Recommendation Chart. Over 150 fluids and gases are listed, and appropriate gland packings are indicated on the accompanying charts.

If you have not already received a copy, please send your name and address to us and we will forward a copy to you.

Crane Packing LTD OF SLOUGH ENGLAND
A COMPANY

BIT BY BIT NONE ARE BETTER THAN Security

Every Security 3-Cutter Rock Bit embodies the manufacturing skill and craftsmanship acquired through two decades of manufacturing know-how. Strict metallurgical control provides the right combination of steels for longest possible life—tough steels in the bit body to absorb heavy loads—hard-surfaced steels with ductile cores in the cutters for wear and shock resistance.

The most modern manufacturing equipment combined with exacting engineering standards give Security 3-Cutter Rock Bits "built-in" characteristics which mean uniform dependability, utmost bit life and full gage hole per bit.

Type S3. Designed for rapid penetration in soft formations, S3 cutters feature exceptionally long, widely-spaced teeth arranged to minimize tooth contact on bottom and facilitate effective cleaning.

Type S6. Designed for fast cutting with light or heavy weights in medium shales, gypsum, salt, chalk, anhydrite, medium lime and unconsolidated formations.

Type M3. For drilling medium formations which may be found too hard for the S6 Bit. Recommended for drilling in formations such as sand, medium shales, medium hard lime and conglomerates.

Type M5. Imparts a chipping and crushing action for effective penetration. Teeth are closely spaced and sturdy in section. Typical formations involve hard lime, hard shale, dolomitic lime, slate and hard anhydrite.

Type H7. For drilling extremely hard abrasive formations. Maximum gage protection is provided by circumferential webs connecting adjacent heel teeth around the gage cutting ends of the cutters.

Send for your free copy of the Security 3-Cutter Rock Bit Catalog.

* *These products are not for sale in the United States or its territories.*

Security

SECURITY ENGINEERING CANADA LTD.
NEW WESTMINSTER, BRITISH COLUMBIA, CANADA
One of the Dresser Industries

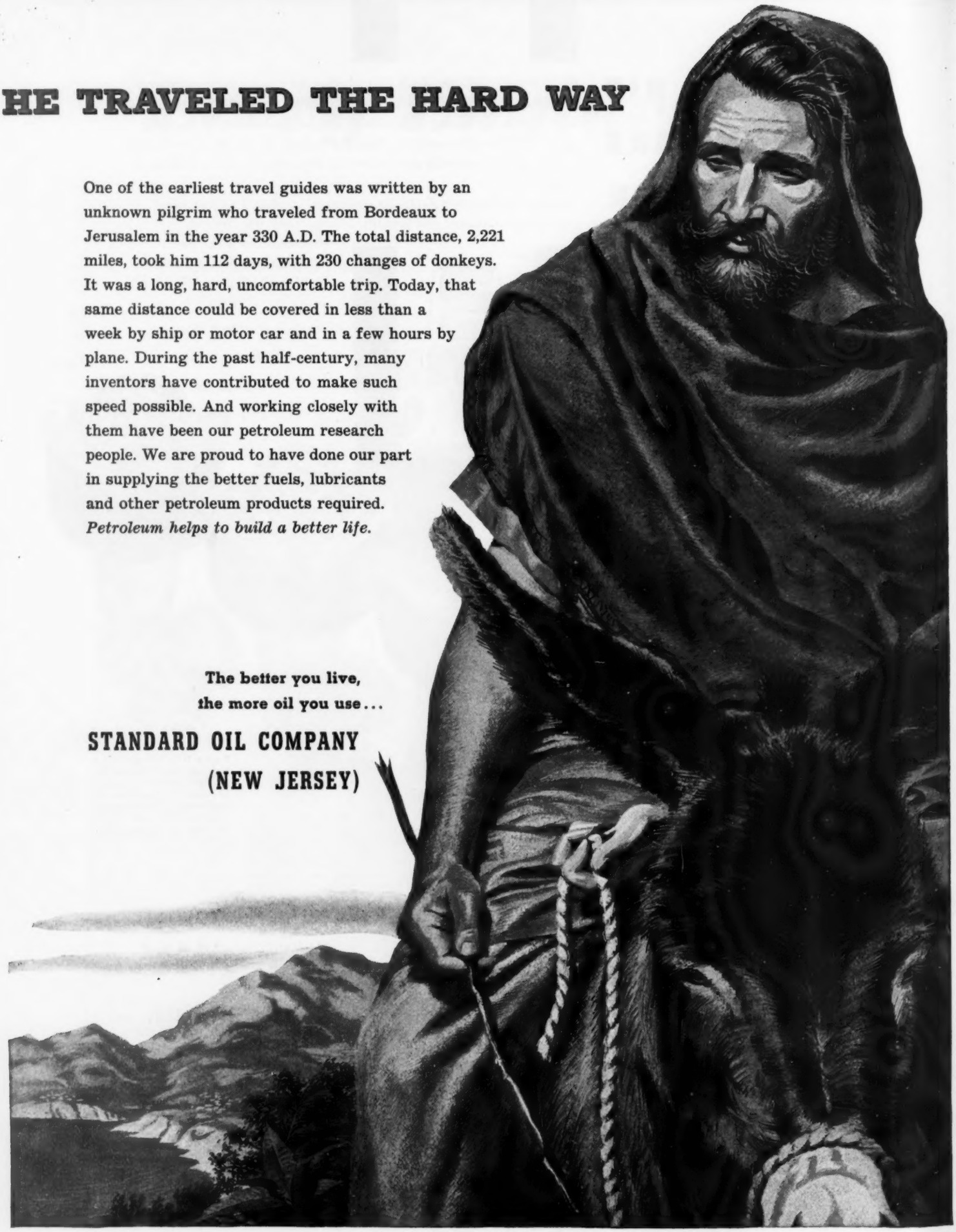
3-CUTTER ROCK BITS

HE TRAVELED THE HARD WAY

One of the earliest travel guides was written by an unknown pilgrim who traveled from Bordeaux to Jerusalem in the year 330 A.D. The total distance, 2,221 miles, took him 112 days, with 230 changes of donkeys. It was a long, hard, uncomfortable trip. Today, that same distance could be covered in less than a week by ship or motor car and in a few hours by plane. During the past half-century, many inventors have contributed to make such speed possible. And working closely with them have been our petroleum research people. We are proud to have done our part in supplying the better fuels, lubricants and other petroleum products required. *Petroleum helps to build a better life.*

The better you live,
the more oil you use...

STANDARD OIL COMPANY
(NEW JERSEY)



Released from the production of War material many far-seeing Engineering Firms have joined in the race to meet the urgent call of Oil producers

The land is cleared

The site is chosen

for Plant and yet more Plant. In this country, Harveys of London have thrown in all their vast resources of men, material and "know how"

A railway is built

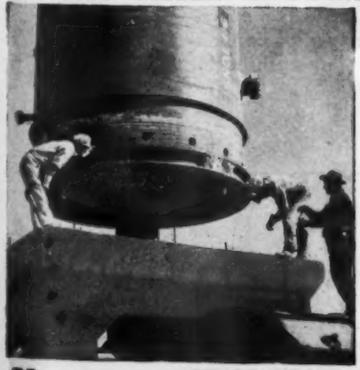
A column arrives

and have so geared production that they are meeting this huge demand with ever-increasing results which will bring benefit to millions.

Off loaded on site

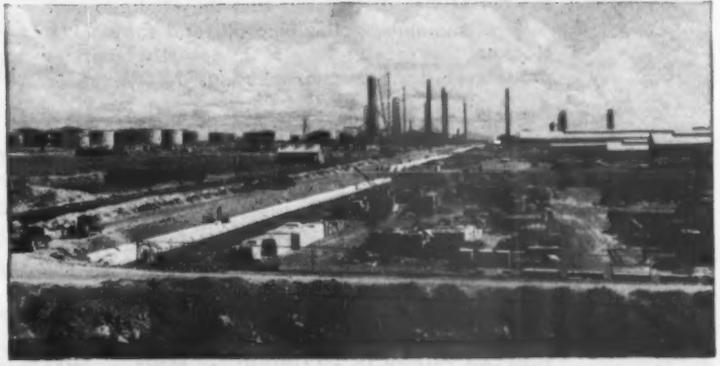
It is gently raised

And so we see, stage by stage, from the clearing of virgin land to the final erection, a history of one of these Fractionating Columns.



and lowered into position

to start immediate production



Necessarily, this pictorial explanation is much condensed, but even so, it clearly evidences another triumph of British Engineering enterprise.

From the Shell Library come these scenes from various stages in the production and transport of one of these huge Fractionating columns.

Harvey

G. A. Harvey & Co. (London) Ltd. Woolwich Road, London, S.E.7

"I wasn't asleep," said the Dormouse

EVERY boy and girl knows the drowsy Dormouse of Alice in Wonderland. He was elbowed and pinched by the Mad Hatter and the March Hare as he mumbled in his sleep at the tea party.

But our young people aren't so well versed in everyday economics. They have a sadly distorted picture of the profits of business. They don't realize why profits are necessary, how small they are, or how they are divided.

For instance, in a recent survey of high school seniors, it was discovered that they believe over 50% of the sales dollar is profit and they think stockholders receive 24% of it. Actually business profit averages less than 8%, with less than 3% distributed as dividends. Business uses most of its profit, moderate as it is, for new plant and equipment, to improve products and to make more jobs.

Misconceptions among our youth bode ill for America's future. They open the door for too ready acceptance of dangerous isms and false foreign philosophies. Such misunderstanding of economics can be corrected only with facts supplied by business itself. You as a leader in your community must share this responsibility.

The American business man must not allow himself to be cast in the role of the Dormouse, pinched and pilloried by the March Hares of communism and the Mad Hatters of the "everything for nothing" state.

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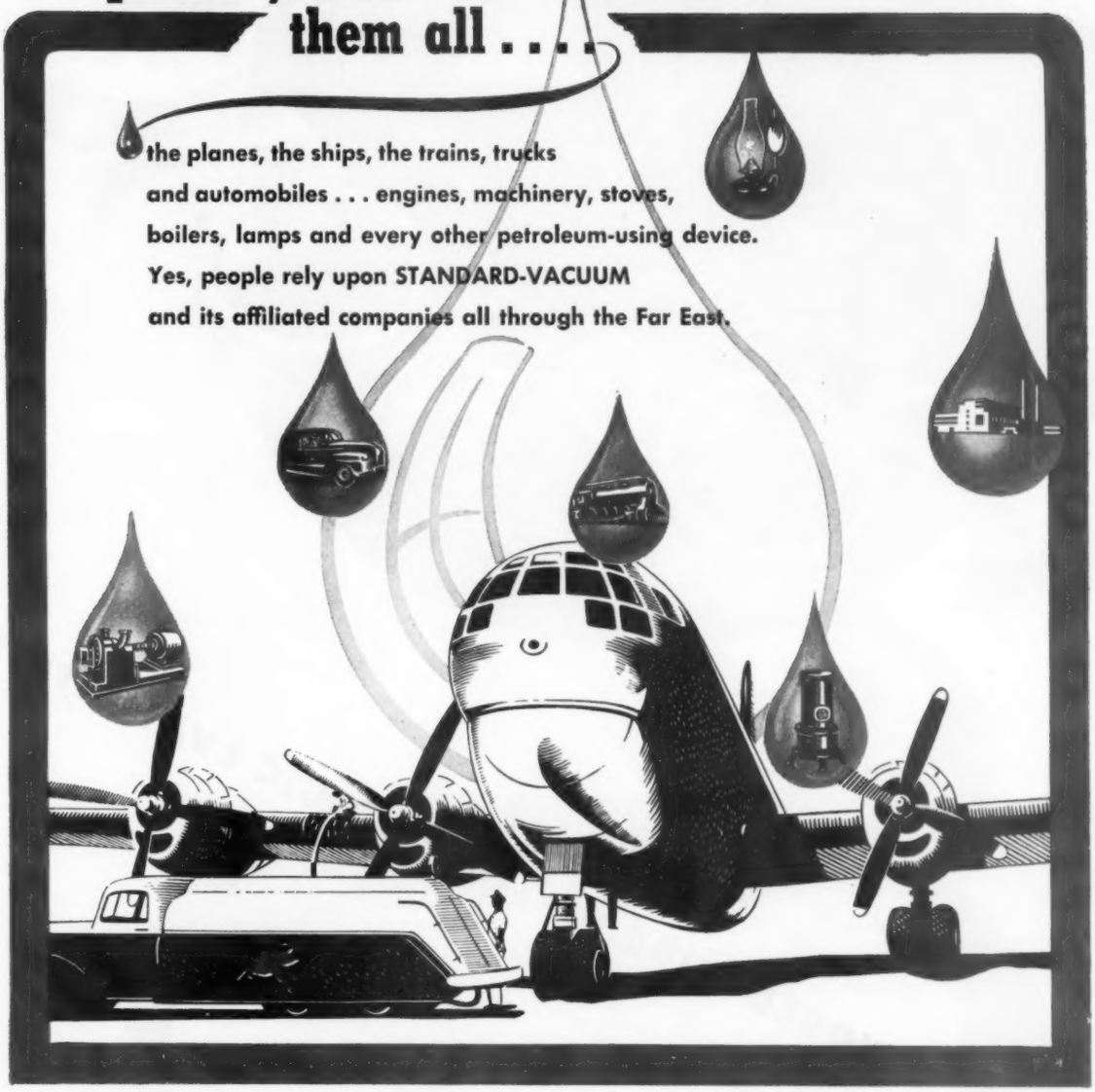
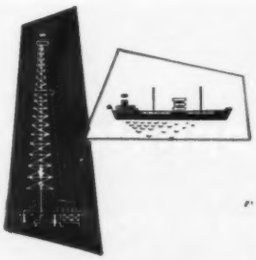
Standard-Vacuum
powers, fuels and lubricates them all . . . .


the planes, the ships, the trains, trucks
and automobiles . . . engines, machinery, stoves,
boilers, lamps and every other petroleum-using device.
Yes, people rely upon STANDARD-VACUUM
and its affiliated companies all through the Far East.



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STANDARD-VACUUM and its affiliated companies serve more than half the population of the world with the petroleum products essential to their economic growth and development, in . . .

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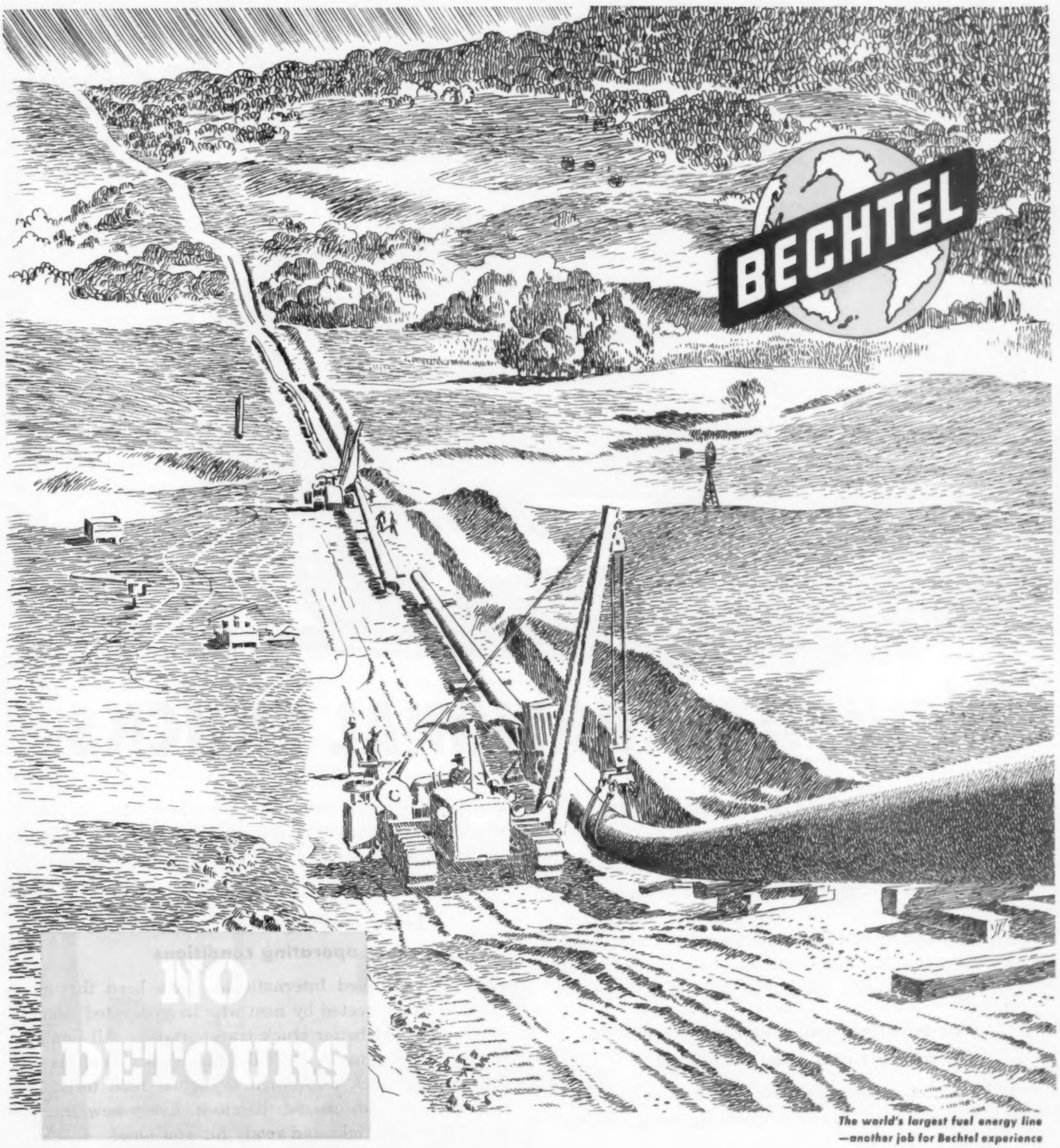

The world's largest fuel energy line
—another job for Bechtel experience

. . . Pipe Lines Go Through . . . Not Around . . . the Tough Spots

Old hands at taking the rugged route, Bechtel pipeliners are "at home" when and where the going gets tough—in foreign lands or here in America.

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"BUILDERS FOR INDUSTRY"

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to save you money!

New INTERNATIONAL TRUCKS

You get *Heavy-Duty Engineering* in every single International Truck!

You can choose a pickup truck or a big six-wheeler safe in the knowledge that every International is heavy-duty engineered throughout. And why can you depend on Heavy-Duty Engineering? Because it identifies truck-building experience that has made Internationals acknowledged leaders in the heavy-duty field for *over 18 straight years!*

Every model offers you new high standards of comfort and easy handling!

The new Internationals offer the roomiest cab on the road! Here's more head room, knee room and leg room . . . deep-cushioned seats . . . natural position steering . . . a variety of controlled ventilation systems. You have full visibility in the one-piece curved Sweepsight windshield—12.6 square feet of safety glass.

There is a complete line of new International Trucks with new frames . . . new valve-in-head engines . . . new rear axles . . . new springs . . . new transmissions . . . new brake systems. These and many other features say "Buy International!" See your International Truck distributor today.

Every model proved under actual operating conditions

All-new, all-proved Internationals have been through a test program directed by men who have devoted years to development of better truck transportation. All outdoors was used for proving grounds. Laboratory analysis was followed by track tests, then by actual road tests. Test convoys were run around the clock. Every new International Truck is right and ready for you *now!*

OTHER INTERNATIONAL HARVESTER PRODUCTS:
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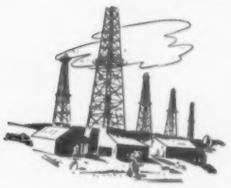
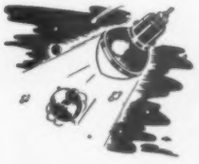
INTERNATIONAL INTERNATIONAL **TRUCKS**

Electrical Apparatus
FOR EVERY INDUSTRY





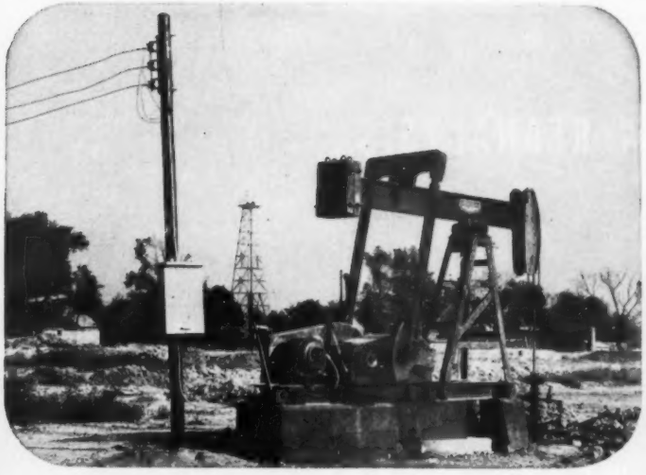
OIL-WELL PUMPING

With this G-E motor-and-control team, you can coax along wells which do best when pumped slowly for long periods. You can step up the pace of those that can take it. In fact, you can tailor the pumping of any individual well to insure maximum life and yield.

Where wells are pumped on an intermittent basis, you simply preset the proper pumping cycle on the G-E starter. Its built-in timing mechanism does the rest, automatically starting and stopping the pump. By eliminating the need for frequent supervision, one pumper can cover more wells and devote more time to other important duties. Where wells are pumped continuously, the timer may be disconnected from service by the selector switch or may be omitted entirely from the control unit.

G-E drip-proof motors provide an economical and reliable drive for the pumping of oil wells. Mechanically, these motors are well protected from wear, weather, and electrical breakdown.

G-E application engineers are ready to help you in selecting motors and control to fit your specific conditions.



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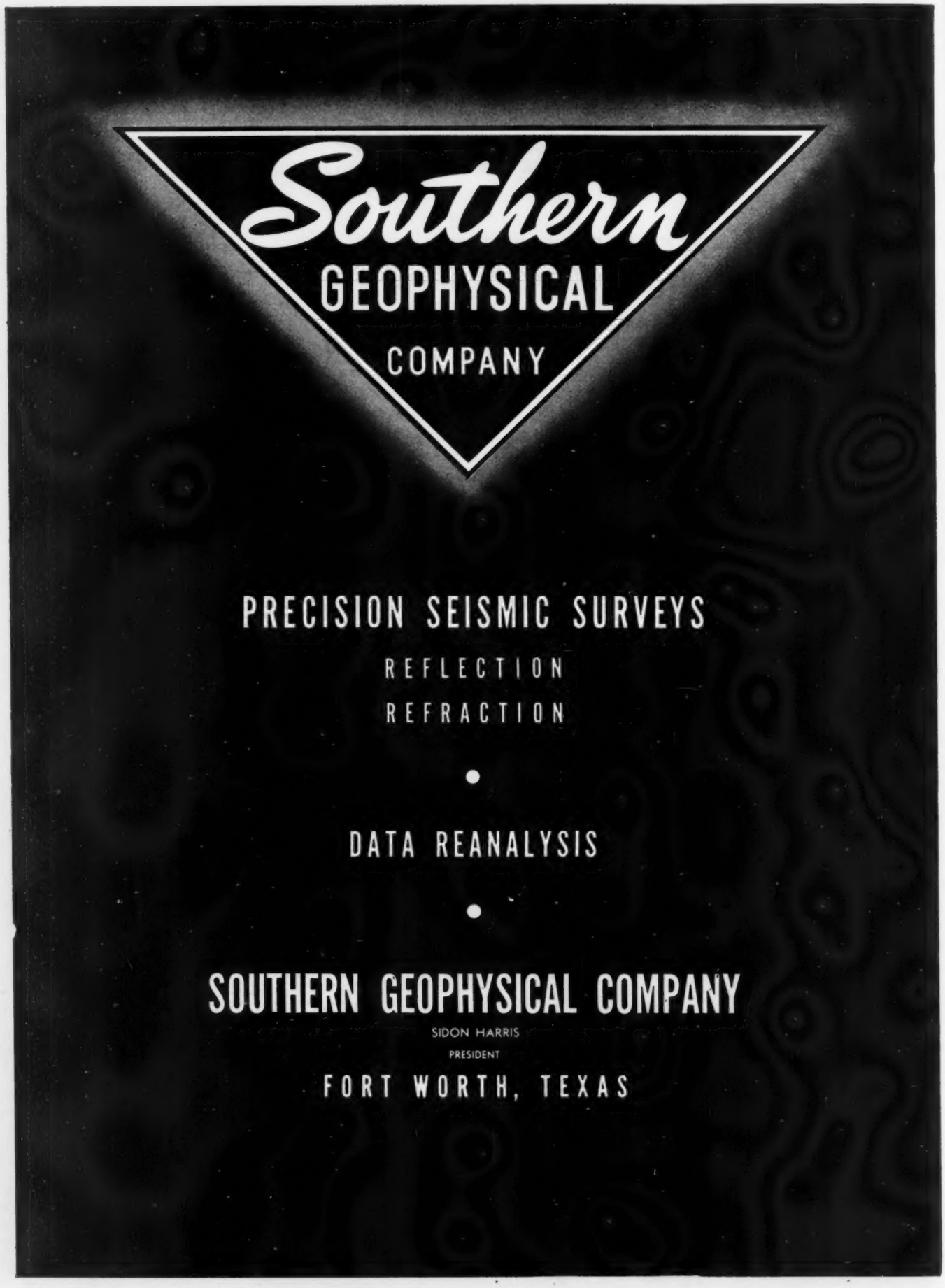
GENERAL ELECTRIC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REFLECTION
REFRACTION
DATA REANALYSIS
SOUTHERN GEOPHYSICAL COMPANY
SIDON HARRIS
PRESIDENT
FORT WORTH, TEXAS

1951
48,000 bbl/day

another one . . .

1949
48,000 bbl/day

. . . like this

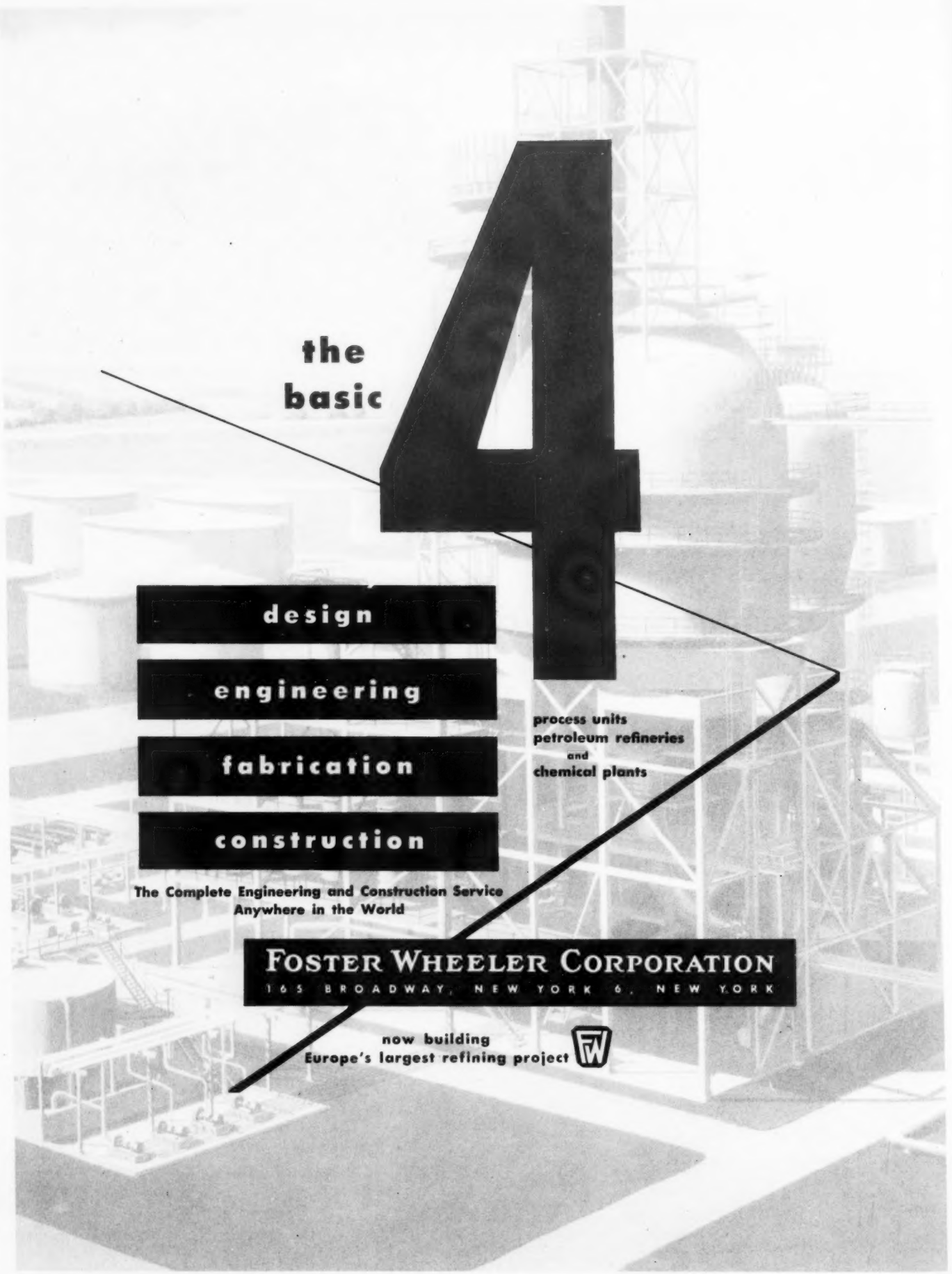
1940
30,000 bbl/day

A sound design lives on . . .
. . . and is reproduced many times

The design of the 1940 unit was "right",— it was duplicated, essentially, in the 1949 unit,— it will be reproduced again in the 1951 unit.

These three crude distillation units are products of the complete engineering and construction service that is Foster Wheeler and were designed and constructed for a major Gulf Coast refiner in collaboration with the engineering department of that company.

FOSTER WHEELER CORPORATION
165 BROADWAY, NEW YORK 6, NEW YORK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FOSTER WHEELER CORPORATION
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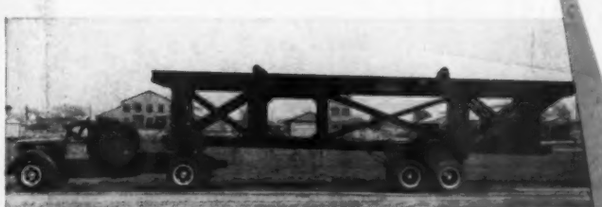
Europe's largest refining project

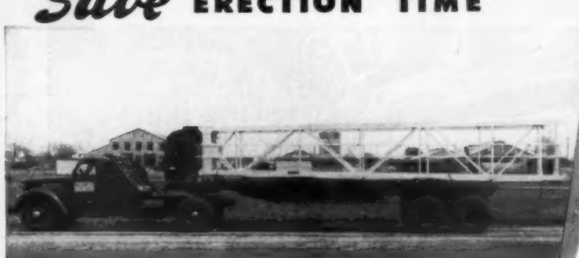
LEE C. Moore

CANTILEVER MASTS



Save TRANSPORTATION TIME

Save ERECTION TIME



Lee C. Moore Cantilever Masts can be loaded easily on standard trailer trucks and transported to the site.

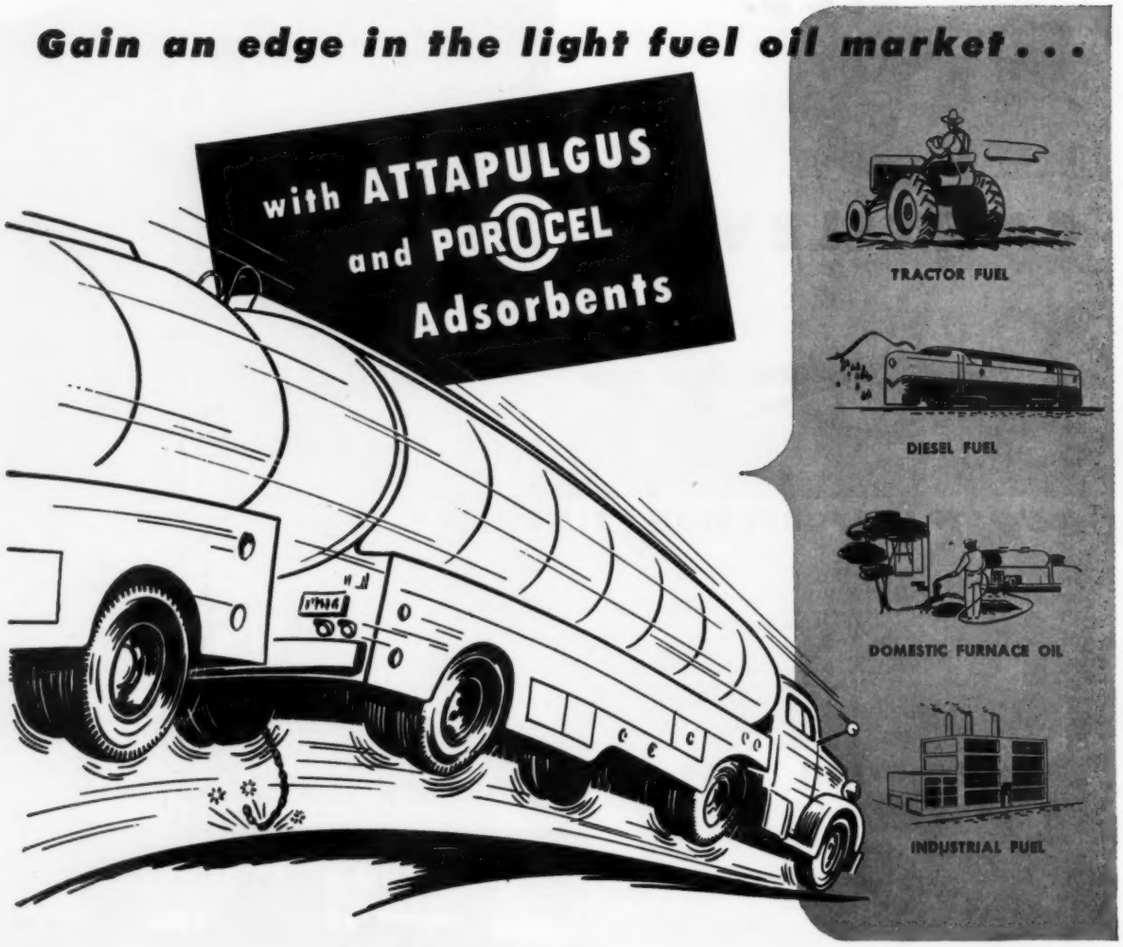
All assembling and stringing up at the location is done on the ground. Drawworks eases mast into position, and in a minimum of time actual drilling operations are under way.

LEE C. MOORE CORPORATION

TULSA • DALLAS • HOUSTON • MIDLAND • SHREVEPORT • WICHITA • CENTRALIA • PITTSBURGH

Export Office — 9 Rockefeller Plaza, New York 20, N. Y.

Gain an edge in the light fuel oil market . . .



In a highly competitive market for distillate fuel oils—Diesel, domestic furnace, tractor, industrial—the refiner who places emphasis on high quality in his products has a decided edge. In fact, selling strategy often is based on points of superiority that assume smaller stature at other times. This applies to other products too—absorption, enrichment, smudge, and insecticide spray oils.

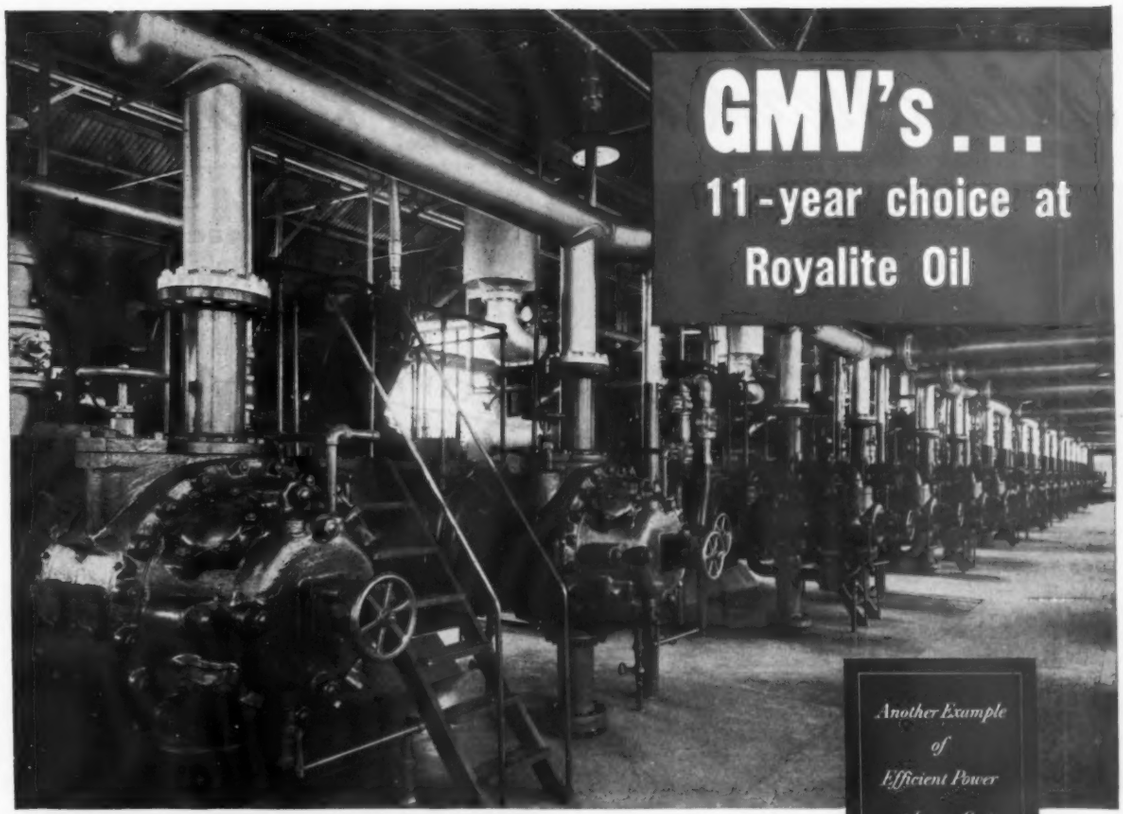
A final straining step using Attapulgus Fullers Earth or Porocel Activated Bauxite is an economically attractive form of light fuel oil quality insurance. These adsorbents are recognized standards for the selective "polishing" of light distillates at low cost. Oils in this range can be filtered to high yields for removal of moisture and sediment. Removal of residual amounts of treating chemicals is accomplished. Moisture haze is removed; color improved or stabilized.

Attapulgus and Porocel adsorbents couple low price with long service life—an unbeatable combination when finishing distillates whose market price generally dictates a minimum of refining expense. Process equipment required is relatively simple and inexpensive—often built from on-site components.

Let's explore the possibilities of improving your position—hence profits—in the light fuel oil market. Our staff is at your service to help select the right adsorbent and the right conditions.

ATTAPULGUS CLAY COMPANY *Fullers Earth* · **POROCEL** CORPORATION *Activated Bauxites*

Dept. X, 210 West Washington Square, Philadelphia 5, Pa.



This line of 10 GMV's in Royalite Oil Company's station No. 1, Turner Valley, Alberta, includes first 3 GMV's ever built and now totals 6,060 GMV horsepower.

GMV's in service at Royalite are used for gas transmission, underground storage, and in the manufacture of natural gasoline.

Royalite Oil Company's three 11-year-old GMV's, the first ever built, are still in continuous service; have held up so well that visitors can't tell them from the seven since added to this company's No. 1 station. Royalite's other two stations are likewise equipped with Cooper-Bessemer V-angles, Type GMV and the smaller GMX.

The most recent addition to station No. 1* is a GMV Turboflow, installed this past summer. It gives Royalite unprecedented advantages — a full 10% increase in power output compared with other units of equal displacement, plus at least a 15% reduction in fuel consumption.

If your plans call for compressor horsepower, bear in mind that Cooper-Bessemer Turboflow V-angles, GMX, GMV and GMW, are now available in sizes from 200 to 2500 hp. Check on the savings you can show!

*Station No. 1 is now owned by Madison Natural Gas Company, Ltd., a totally owned Royalite subsidiary.

The Cooper-Bessemer Corporation

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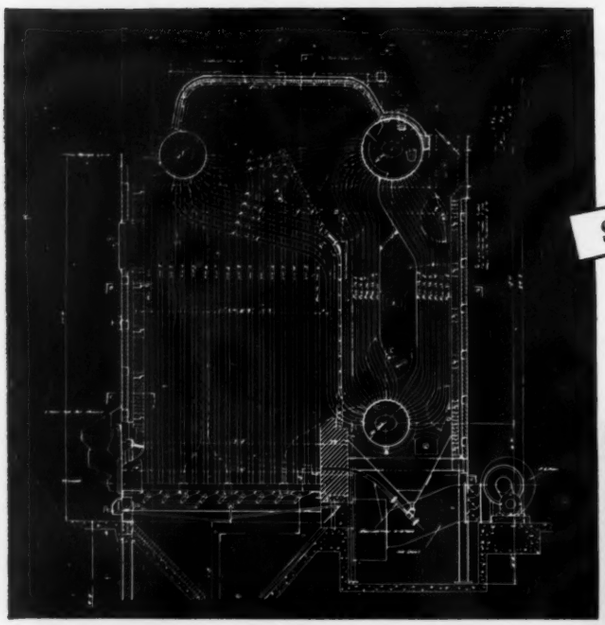
New York City Washington, D. C. Bradford, Pa. Parkersburg, W. Va. San Francisco, Calif. Houston, Dallas, Greggton, Pampa and Odessa, Texas Seattle, Wash. Tulsa, Okla. Shreveport, La. St. Louis, Mo. Los Angeles, Calif. Caracas, Venezuela Gloucester, Mass. Calmes Engineering Co., New Orleans, La.

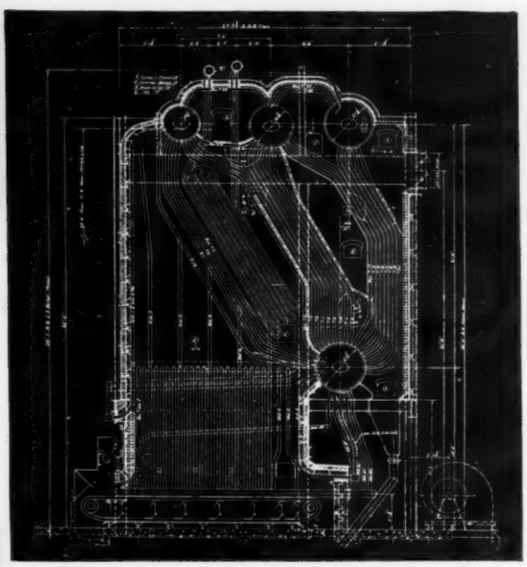
Quick Steaming at all Ratings!



Carry high overloads with high efficiency

SPECIFY **Vogt**

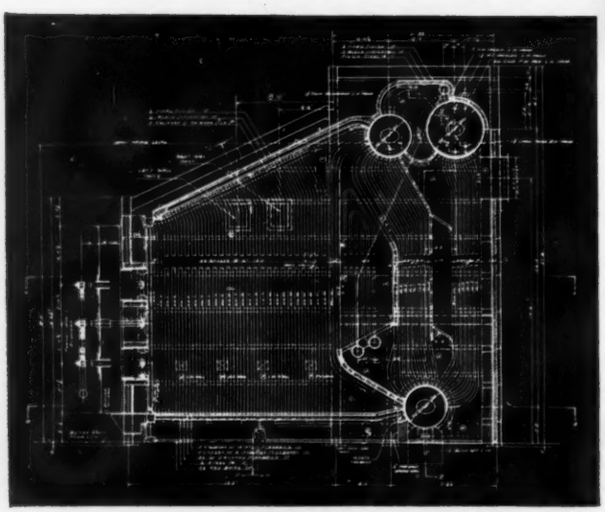
STEAM GENERATING UNITS



CLASS VL Two 27,500 pounds per hour units, installed at Brown-Forman Distillers Corporation, Louisville, Ky. Features large furnace volume in limited space, with high ratio of radiant heating surface.

CLASS LE Mt. Carmel Public Utility, Mt. Carmel, Illinois, is served by this 60,000 pounds per hour unit. Generous steam liberating surfaces and steam space permit wide fluctuations in load.

CLASS VR 70,000 pounds per hour steam generator at Humble Oil and Refining Company, Johnsue, Texas. An efficient, high-duty unit with water cooled furnace, using refinery gas fuel.



Vogt builds a complete line of bent tube steam generators, designed to burn solid, liquid, or gaseous fuels to meet specific operating conditions. Superheaters, air preheaters, economizers, water walls, and soot blowers can be readily incorporated. Bulletins with general information and showing typical installations are available upon request.

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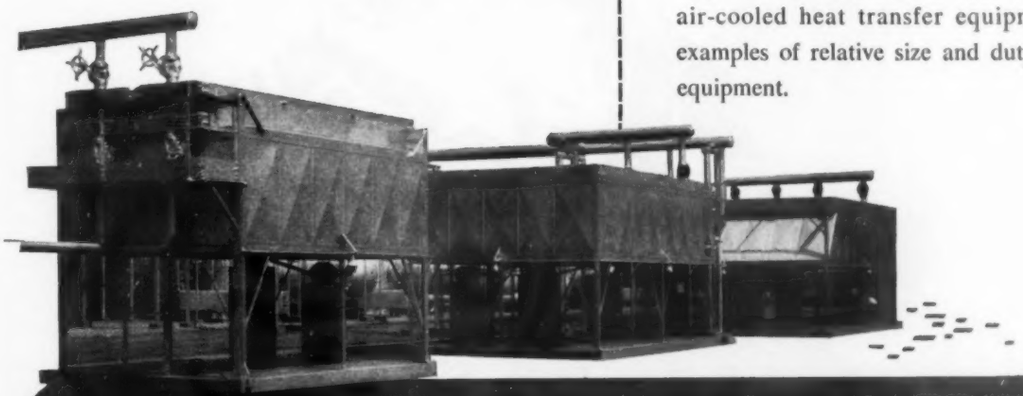
Here are 15 TYPICAL APPLICATIONS for FIN-FAN AIR-COOLED Heat Exchanger Equipment

For many years, Fin-Fan Air-Cooled Heat Exchangers have proved their worth by giving reliable, economical service in many and varied applications. The Fluor Corporation, Ltd., and Griscom-Russell Company, pioneer-partners in the air-cooled heat transfer field, offer the following to show the large variety of practical applications for air-cooled heat transfer equipment and examples of relative size and duty of such equipment.



GAS COOLING	Natural Gas After-Cooler	13,920,000	80	46′ x 25′
	Manufactured Gas Cooler	11,165,000	50	23′ x 21′
	Natural Gas After-Cooler	3,400,000	15	11′ x 21′
	Natural Gas Inter-Cooler	7,890,000	40	23′ x 21′
VAPOR CONDENSING	Reflux Condenser	18,407,000	90	48′ x 25′
	Primary Condenser	4,652,000	40	11′ x 25′
	Still O.H. Condenser	4,875,000	34	16′ x 21′
	Debutanizer Condenser	11,930,000	60	23′ x 25′
	Still Reflux Condenser	39,110,000	60	46′ x 25′
	Steam Condenser	87,300,000	300	138′ x 31′
	Steam Condenser	2,880,000	10	10′ x 6′
LIQUID COOLING	Vegetable Oil Cooler	628,000	15	6′ x 17′
	Absorption Oil Cooler	14,915,000	100	32′ x 17′
	Quenching Oil Cooler	1,665,000	50	23′ x 25′
	Amine Solution Cooler	19,300,000	175	38′ x 25′
	Stabilized Crude Cooler	125,100,000	700	315′ x 25′
	Jacket Water	2,400,000	5.5	16′ x 12′
	Jacket Water	28,800,000	100	70′ x 24′

A new 8-page bulletin on Fluor-GR Fin-Fan Heat Exchangers is now being prepared. Write in and reserve your copy by post card or letter.

Why Fluor-GR Fin-Fans Lead The Field

The Fin-Fan Air-Cooled Heat Exchanger is unique in its development and manufacture. It is the result of the engineering skill of *two* companies, *each* long recognized as leaders in their respective fields. It combines Fluor's experience in the design, fabrication and field erection of air-moving systems with Griscom-Russell's experience in heat transfer.

Success is evident in repeat orders. Since 1941, hundreds of Fluor-GR Air-Cooled Heat Exchangers have been installed throughout the world . . . nearly 50% have been repeat orders!

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Gulflube Motor Oil H.D. is a quality heavy-duty detergent oil, performance proven in thousands of automotive, industrial, and marine engines. It's the ideal oil for tough lubricating jobs.

You get an important plus value when you use Gulflube Motor Oil H.D.: the helpful counsel of Gulf Lubrication Engineers, specialists in scientific gas engine lubrication. Write, wire, or phone to:

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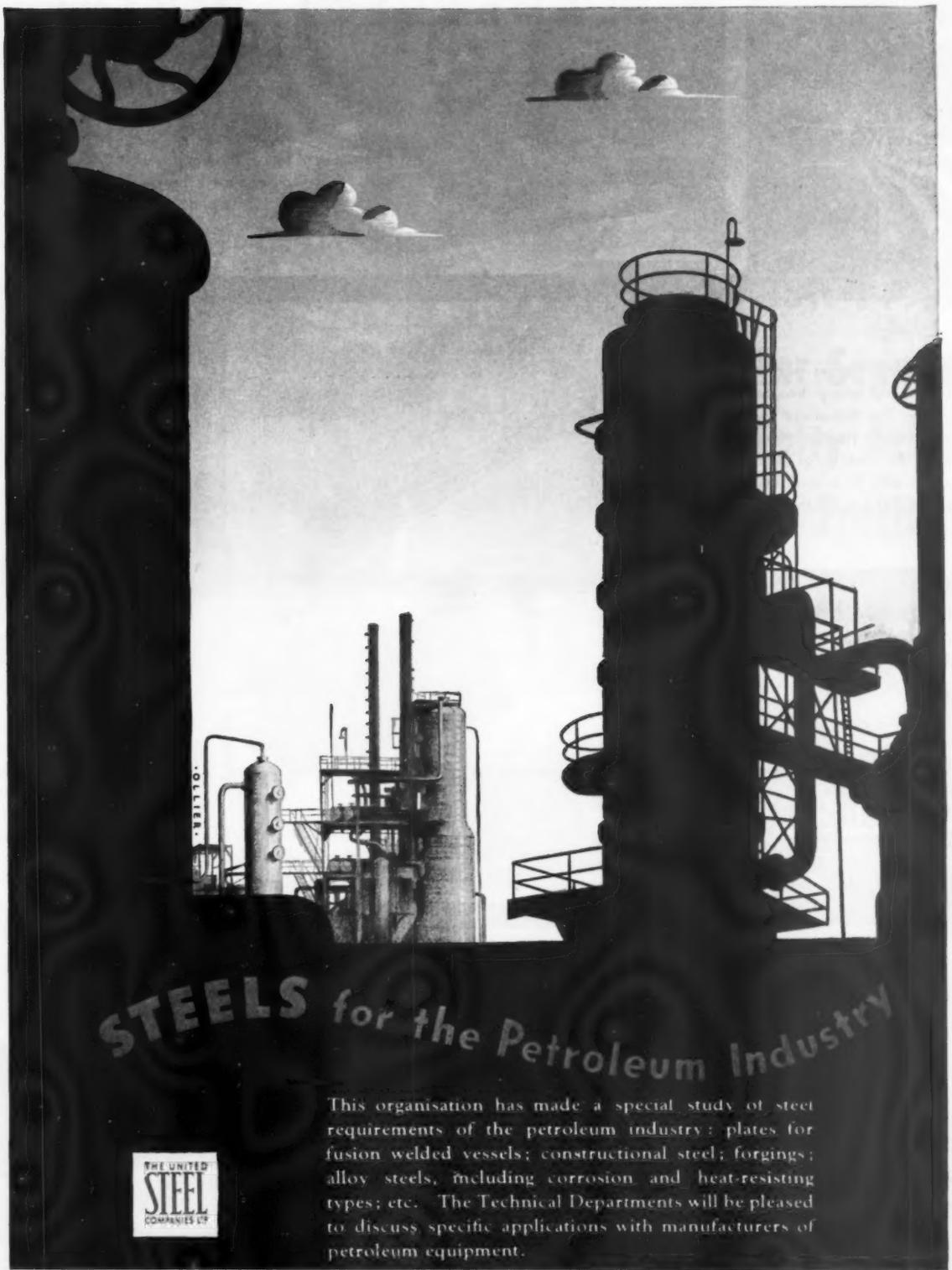
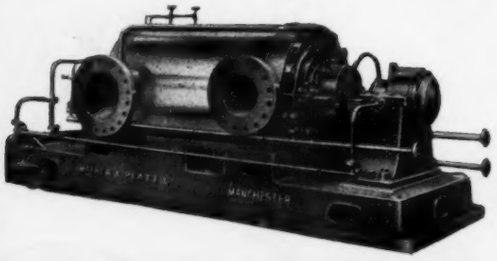

STEELS for the Petroleum Industry
This organisation has made a special study of steel requirements of the petroleum industry: plates for fusion welded vessels; constructional steel; forgings; alloy steels, including corrosion and heat-resisting types; etc. The Technical Departments will be pleased to discuss specific applications with manufacturers of petroleum equipment.
THE UNITED STEEL COMPANIES LTD
THE UNITED STEEL COMPANIES LIMITED OF SHEFFIELD ENGLAND
THE LARGEST STEEL PRODUCERS IN THE BRITISH COMMONWEALTH

US 37

Centrifugal Pumps
& FLAMEPROOF MOTORS

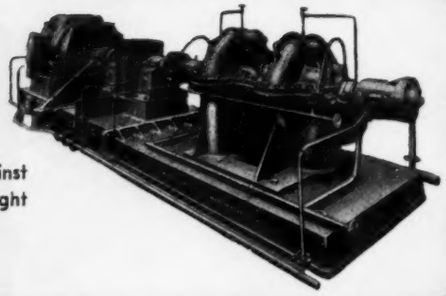
Main Pipeline Pumps....



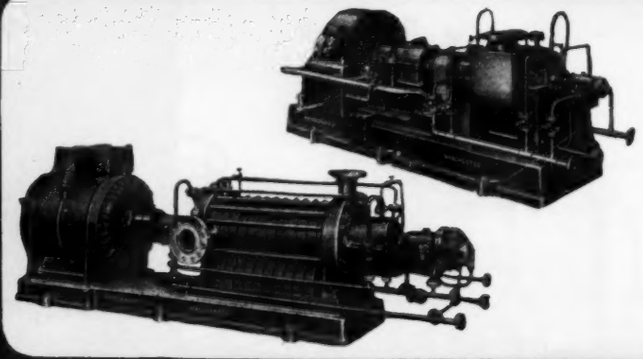
Mather & Platt multi-stage 'Plurovane' pumps were amongst the earliest centrifugal pumps installed for main line work. The pump shown on the left is a typical modern 'Plurovane' designed for a throughput of 50,000 bbls/day of crude oil against a pressure of 750 p.s.i. when running at 1500 r.p.m.

Transfer and Loading Pumps

Our standard ranges include a pump for nearly every transfer or loading duty. The two-stage "Medivane" pump illustrated on the right can handle 700 tons/hr. of crude or products against heads up to 500 ft. It is driven through a gas tight wallbox by a 550 h.p. Mather & Platt Motor.



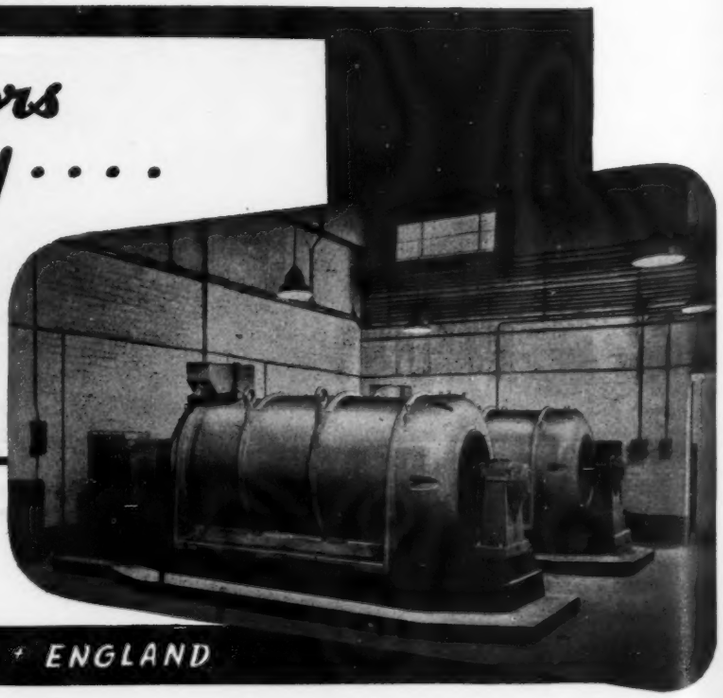
Refinery Process Pumps



Our long refinery experience at home and abroad enables us to supply pumps for the most arduous refinery duties. The illustration shows typical units:—a steam turbine driven pump handling oil at 500 degs. F. and a motor driven "Plurovane" pump dealing with light volatile hydrocarbons.

Flameproof Motors on Pipeline Duty....

Mather & Platt electrically-driven centrifugal pumps on an oil pipe line. The motors here illustrated are of the totally enclosed flameproof type, and are of 1,000 h.p. capacity, fed from a 3 phase 50 cycle 6000/6600 volt supply. They are squirrel cage direct-on started machines with a starting current of four times full load value.



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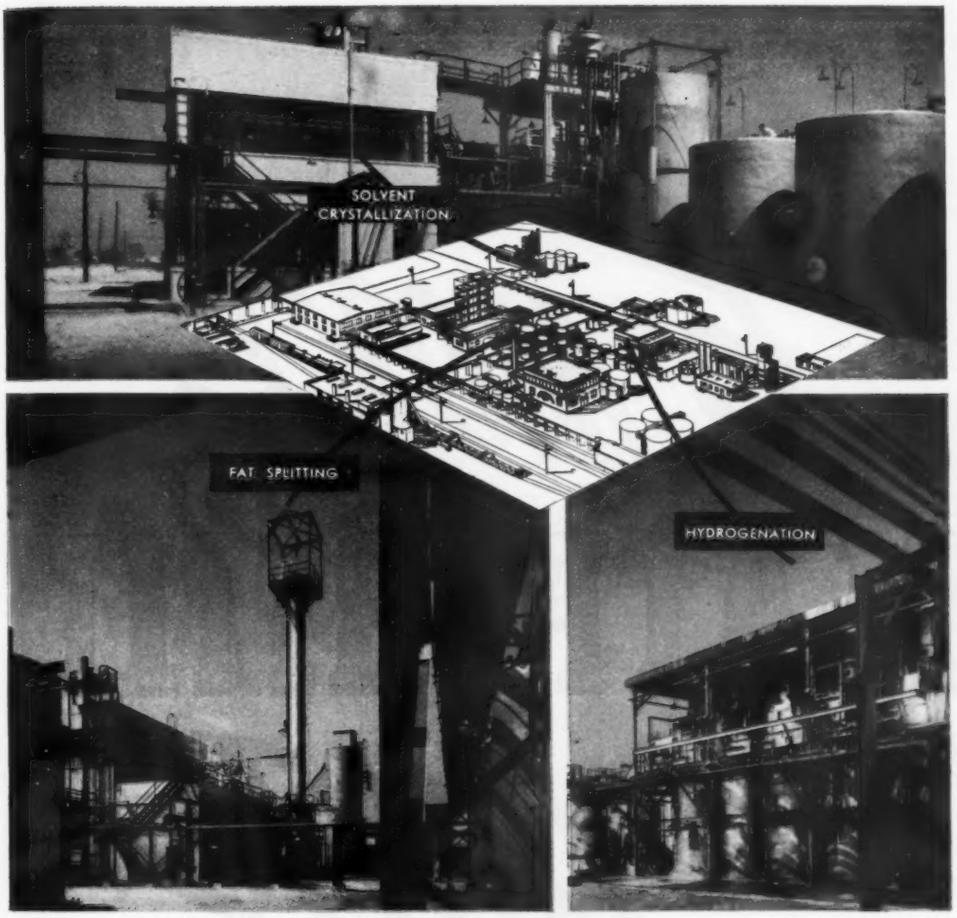

A New Process For Separating Fatty Acids by Fractional Crystallization

ANOTHER BADGER FIRST

The Fatty Oil Fractional Crystallization Process utilizing solvents as a means of separating fatty acids offers the industry an opportunity to make a wide variety of products of high purity and excellent yield at low operating cost.

A new Fatty Acid Fractional Crystallization unit, engineered and constructed by Badger, is now in successful operation at Armour's McCook, Illinois plant. This unit permits separations with solvent over a wide range of operating temperatures. As a result, a variety of charge stocks can be processed and products of widely divergent characteristics manufactured.

This is a part of Armour's integrated plant for processing of animal and vegetable fats, designed on the basis of developments and extensive experience of Armour and Texaco, and engineered and constructed by Badger with the exception of three specialized units furnished by others. Among the Badger-built units, as well as the crystallization unit, are installations for fat splitting, hydrogenation, refining and bleaching, product finishing and a boiler house, waste recovery system, tankage, warehousing and shipping, and all auxiliary facilities.

The Fatty Oil Fractional Crystallization unit is operated under license from the Texaco Development Corporation. Into this unit Badger has built the "know-how" of both Texaco and Armour. This is another example of Badger's unique ability to convert basic design of a new development into a successful commercial plant.

E. B. BADGER & SONS (Great Britain) LTD.
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PROCESS ENGINEERS and CONSTRUCTORS for the PETROLEUM, CHEMICAL and PETRO-CHEMICAL INDUSTRIES

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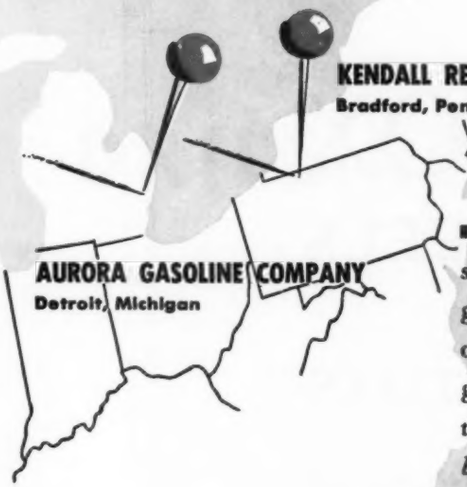

■ In a matter of months Platforming has proved its superiority in octane improvement of straight run gasolines . . . in the production of a blending component of unequalled quality . . . in the building of new gallonage records. So conclusive has this proof been, that *five more Platforming units are now being built from Texas to Pennsylvania.*

These progressive refiners installing the Platforming process have realized the advantages provided by the improvement of low octane straight run gasolines. Soon they will be providing their markets with a higher quality product . . . increasing gallonage at the point of sale and substantially building a more profitable operation.

Refiners . . . both major and independent . . . from coast to coast are intensely interested in Platforming, and it may be the *one process* that will *permanently* solve your problem.

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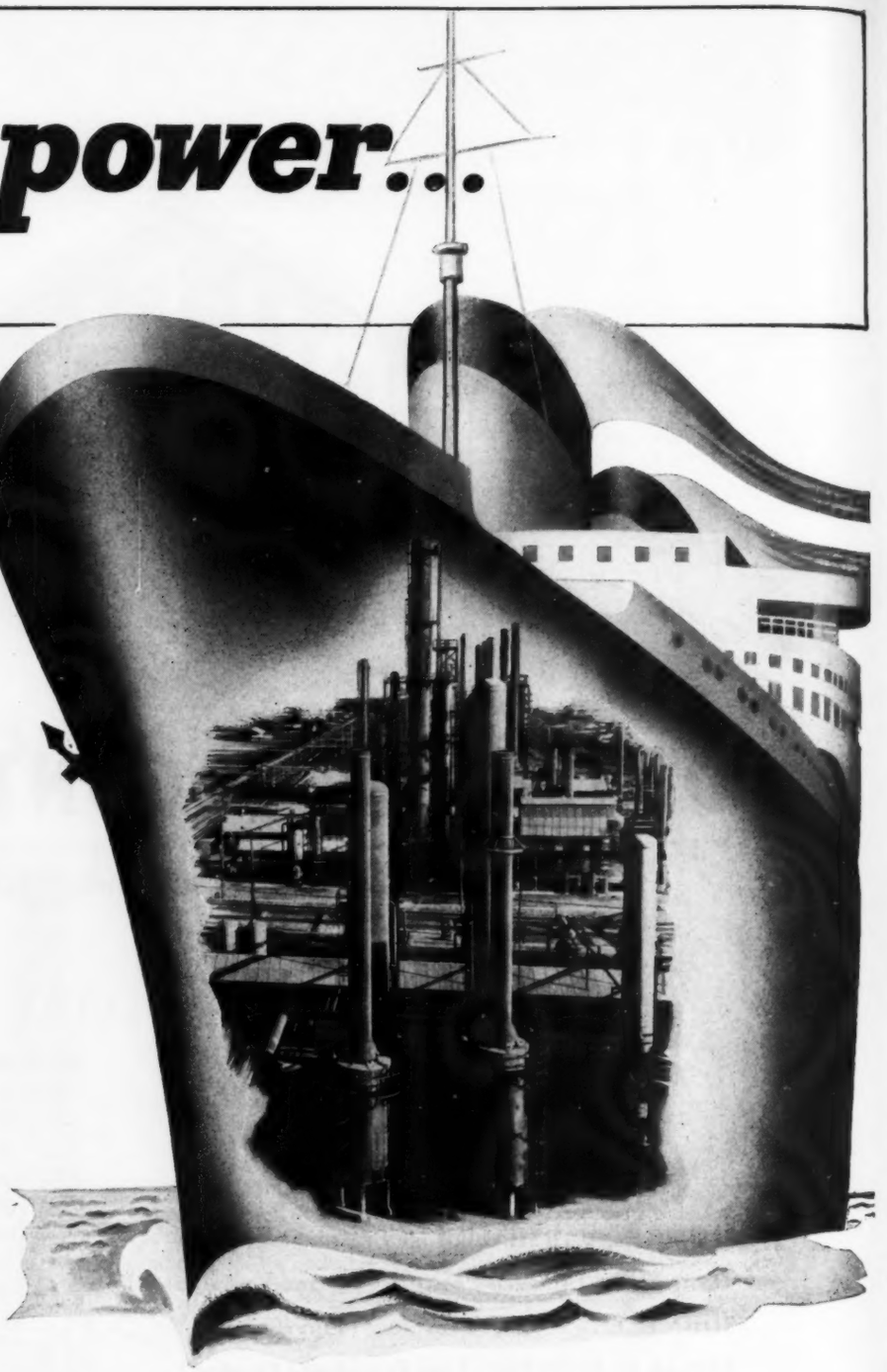

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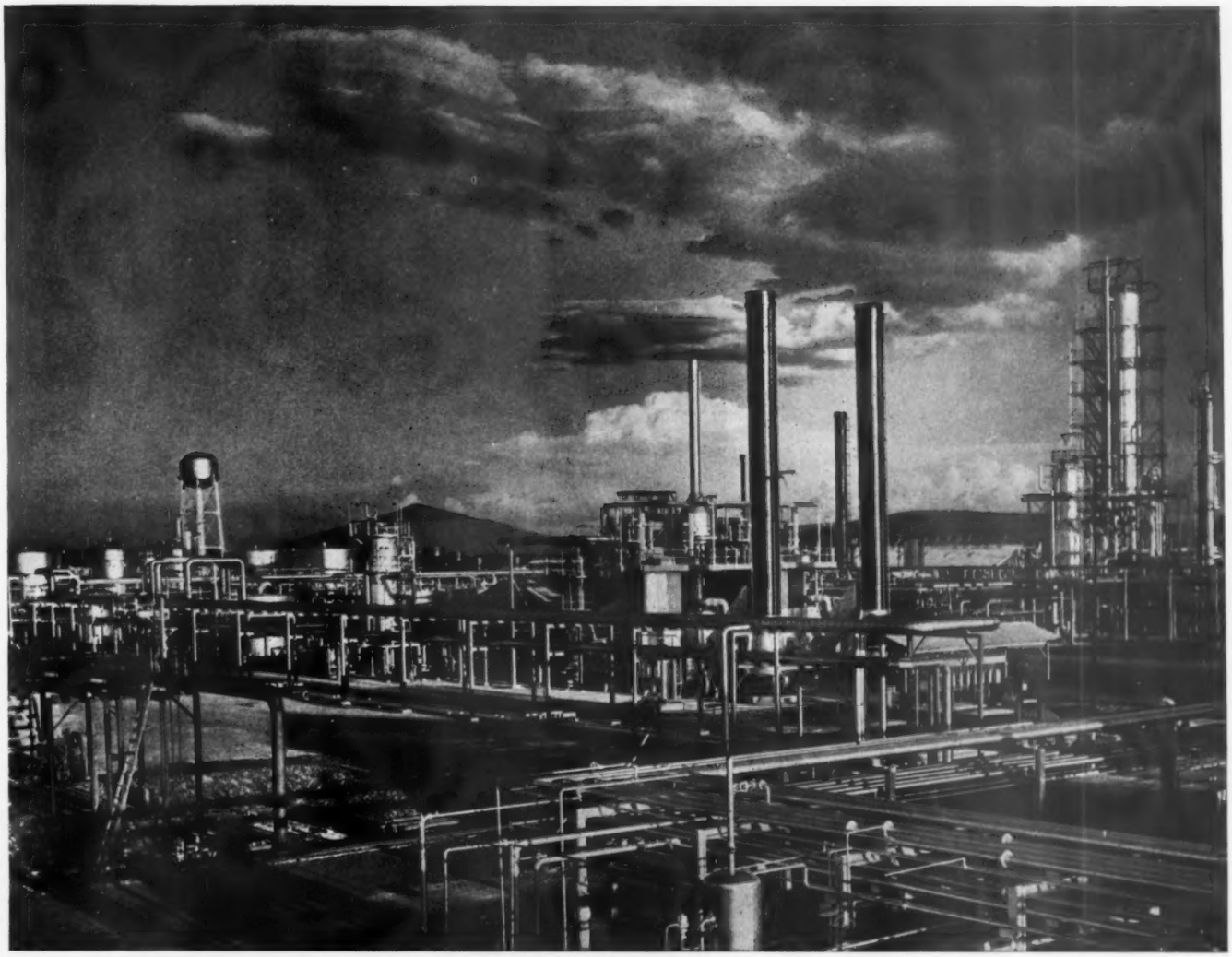

New 30,000 Barrel Pemex Refinery at Salamanca

Engineered and Constructed by Arthur G. McKee & Company

LOCATED in an important industrial and agricultural area of the high plateau region of Mexico, this refinery is one of the most beautiful ever built. Sound, thorough engineering is clearly evident in its well-planned, clean-lined arrangement and efficient construction.

The complete refinery is comprised of processing units for Crude Distillation, Thermal Cracking and Catalytic Desulfurization and units for gasoline and kerosene treating and ethyl blending. Power plant, steam plant, water supply system, tankage and extensive shop and maintenance facilities are provided.

With a 30,000-barrel-per-day capacity, this new refinery is designed to produce gasoline, kerosene, diesel oil, other gas oils, liquefied petroleum gas and residual fuel oil.

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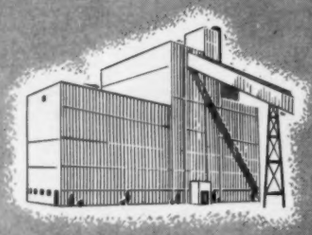
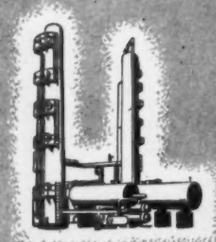
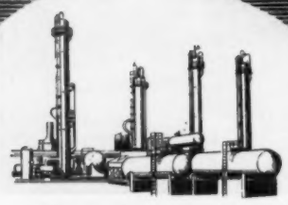


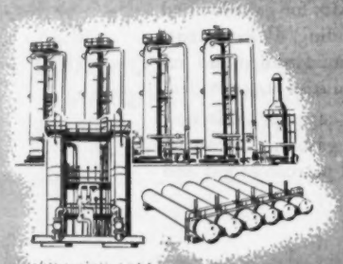
POWER DIVISION



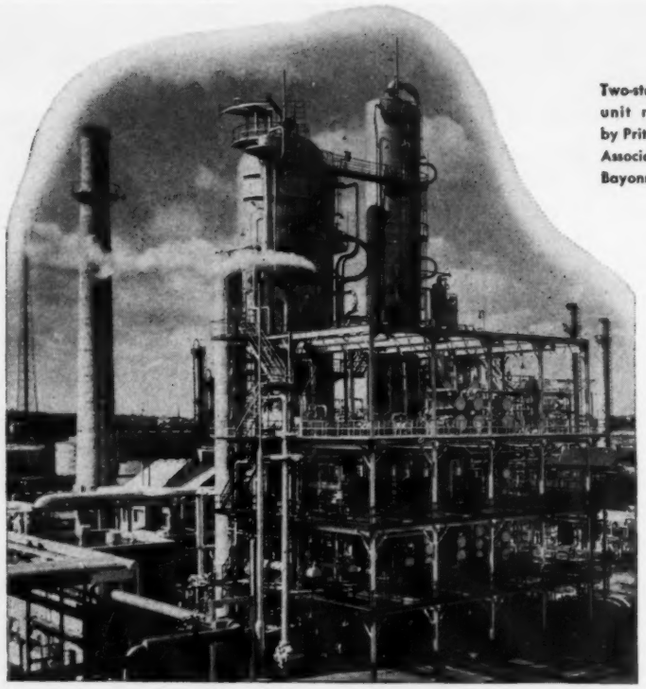
CHEMICAL DIVISION



PETROLEUM DIVISION



NATURAL GAS DIVISION



Two-stage crude distillation unit recently completed by Pritchard for Tide Water Associated Oil Company at Bayonne, New Jersey.

Pritchard Designs for Versatility and Accessibility

This unit is typical of Pritchard's forward looking ingenuity in Design, Engineering and Construction. Designed to the customer's requirements for replacement of an existing crude unit and for processing six different types of crude oil at a nominal capacity of 22,500 bbls. day, this unit simultaneously produces eight different distillate fractions ranging from light gasoline to cylinder stock!

At the same time particular care was taken to design the unit for maximum accessibility to the heat exchanger equipment, thus facilitating handling and reducing "shut down" time and maintenance costs.

For the most modern advancements in petroleum processing, let Pritchard engineers develop your next project from drawing board to "on stream."

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DU PONT SERVICES

meet the specific needs of the refiner

IN RESEARCH

IN MANUFACTURING

IN MARKETING

USE DU PONT TETRAETHYL LEAD COMPOUNDS

These Du Pont Services are Applicable to Your Problems

To aid the refiner in the most effective use of a complete line of gasoline additives, Du Pont provides an extensive service program. The following outline highlights where some of these services are of aid.

IN RESEARCH

Research Helps Match Fuels and Additives to Engine Needs—In the Du Pont Petroleum and other laboratories research effort is being directed at those problems of the refiner which involve development of new fuels and better combustion control.

Problems Under Investigation—Among specific studies being made are the following:

Combustion Reactions — Investigating the chemical changes that take place in the air-fuel mixture under pressure just prior to combustion and during combustion.

Deposit Studies—Research into the chemical nature of engine deposits.

Sulfur in Gasoline—The how and why of sulfur effect upon octane number of leaded fuels.

Effect of Fuel Components on Performance—Research, recently completed, provides information on the blending of fuel components as they affect TEL requirements and performance.

Du Pont Research Is of Use—Significant findings on research projects are made known to refiners:

Through Publication of Papers—Papers on research results are presented at technical society meetings.

Through Meetings with Refinery Research Groups—Members of the Du Pont research staff discuss projects under investigation in meetings with a refiner's own research group.

Company-wide Research—Findings of other Du Pont research laboratories are available at all times to the Petroleum Chemicals Division for consideration as to their application to the petroleum industry.

●

IN MANUFACTURING

Aid in the Most Effective Use of Additives—Du Pont provides a complete range of services that function within the refinery.

TEL Blending—Du Pont representatives are thoroughly familiar with requirements as they apply to men, equipment and methods.

Blending Plant Design, Construction—Complete construction drawings and specifications for blending plants, as well as advisory help on plant site selection and construction, are available.

Blending Plant Operation—Du Pont representatives aid in the training of operating personnel.

Maintenance and Repair—Assistance is always available when repairs must be made.

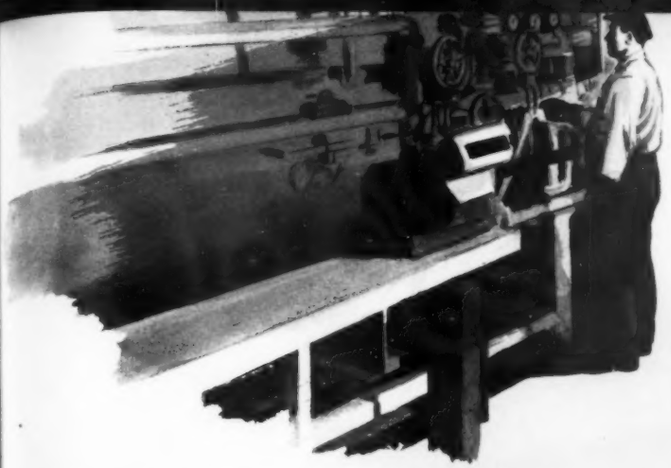
Tank Entries—Petroleum Chemicals representatives will attend and advise on cleaning of tanks that have contained leaded gasoline.

General Refinery Safety Program—An over-all refinery safety program prepared by Du Pont is available to any refiner.

Field Laboratory Services Work on Many Problems—Five Field Laboratories throughout the country assist on problems involving the use of additives.

TEL Blending Studies—These laboratories are equipped to make TEL analyses and blending studies on gasoline stocks.

Octane Ratings—They also make routine octane ratings quickly and accurately.



Gasoline Quality Survey — The laboratories cooperate with refiners in nation-wide sampling and local evaluation of their fuel.

Assistance with Other Additives—Recommendations on the use of Du Pont Gasoline Antioxidants, Metal Deactivator, Gasoline Dyes and other additives are also available through the laboratories.

●

IN MARKETING

Services Helpful in Dealer Training and Sales Planning—These services are designed to supplement and strengthen the individual refiner's own promotional efforts by supplying assistance at those points where it is felt Du Pont can be of most help.

For Dealer Education—To aid you in keeping your dealers better informed on the sales qualities of your fuels, Du Pont offers the following aids:

Informative Talks — Non-technical or semi-technical talks for dealer meetings.

Cartoon Movie—A seventeen-minute, four-color, cartoon movie, understandable to any group, "What Makes A Gasoline Good?"

Cartoon Book—A 16-page cartoon book in full color telling the same story.

Instructive Laboratory Meetings—Tours of the Du Pont Field Laboratories and meetings for refinery sales engineers or marketing groups.

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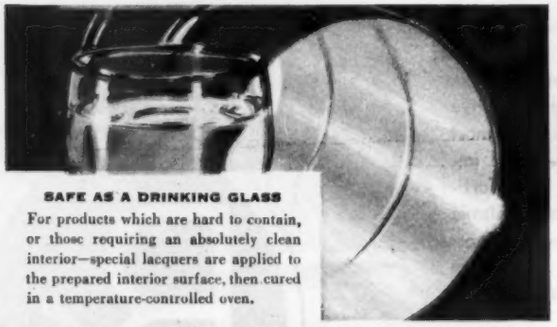

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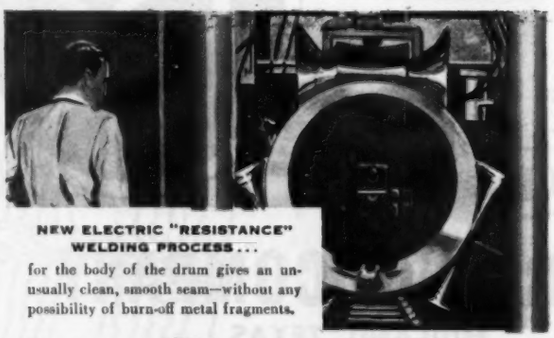

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CONTENTS FOR SEPTEMBER, 1950 Vol. 21, No. 10

43 **Oil's Part in World Preparedness**

44 **Tapline in Final Construction Stage**

47 **Oil Industry Moves Forward with Plans for Emergency**

48 **Mexico's Distribution Problem Eased by New Salamanca Refinery**

53 **Iraq Oil Industry Moves Toward Great Expansion**

56 **First Liquid Feed TCC Unit Completes Year of Operation at Casper**

60 **World Production Tops Ten Million Barrels Daily**

64 **World Oil Consumption Increases Seven Percent in First Half**

66 **Search for Oil in Papua**

70 **LPG Unit at Sinclair Refinery**

72 **Residual Oil Utilization**

76 **International Notes**

82 **Oil Company Changes**

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THIS MONTH'S COVER

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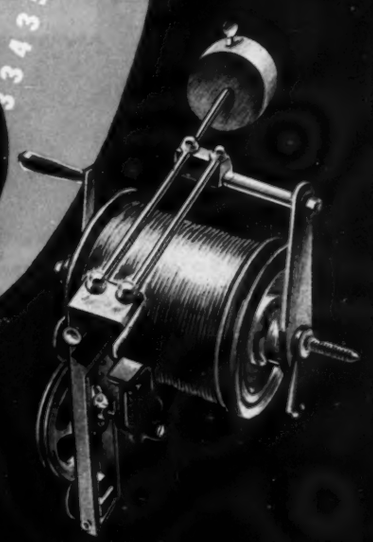

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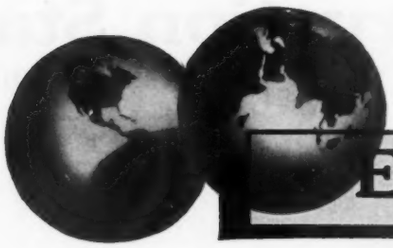


Editorial

Oil's Part in World Preparedness

WORLDWIDE upturn in the demand for petroleum was fully established by midyear 1950. It is evidenced by expanded activity in every division of the industry, by production in the month of July 14 percent above a year earlier, a 15 percent rise in refining operations and a corresponding increase in transportation activity. Since oil is today more than ever before a fundamental factor in the industrial life and progress both of nations and of individuals, the rising tempo of oil industry activity in reality measures the intensification of the upward surge which is to be observed in the record-setting pace of manufacture and in the statistics which show employment at the highest point it ever has reached.

In the United States production of crude had reached almost 5,500,000 barrels daily by mid-July. Production in other countries was roundly 4,800,000 barrels per day, raising the world total above ten million barrels for the first time. Demand was practically at the same level since nowhere were stocks increasing. Based on the gain recorded during the first six months of 1950, the estimates of industry statisticians have agreed in forecasting a continuing gain for the second half of the year, with demand for gasoline some seven percent above the corresponding period of 1949 and middle distillates up around 20 percent. These estimates are somewhat above the forecast of the Bureau of Mines for the United States but appear to be justified by the rising consumption in outside countries, an estimated increase of 13.5 percent for all products.

This was the condition that resulted from the high tempo of industrial activity before the start of armed conflict in Korea introduced new and far-reaching factors, the full extent of which cannot yet be measured but which are certain to affect the oil industry throughout its international ramifications. To meet the needs of United Nations forces in Korea will impose a substantial draft on certain petroleum products, but, insofar as operations can be confined to the area presently involved, it appears that military requirements can be met from the United States and other available sources without interfering seriously with the movement of supplies through ordinary channels for civilian use.

Obvious military demands are greatly increased quantities of high-test aviation gasoline, to produce which will require more than a proportional increase of crude. Emergence of the jet plane as an important military weapon calls for substantial amounts of jet fuel requiring both gasoline and distillate. Increased demand for high octane aviation fuel will require a larger production of alkylate, which will be met by reactivation of some of the several government-owned alkylation plants which have been maintained in standby position since the end of World War II. Other specialized products required by military operations are toluene and butadiene for which existing facilities are adequate.

To power mobile equipment in the field and the ships used to move men and supplies to the fighting front will require great quantities of gasoline and fuel oil, much of which can be obtained from sources less distant than the United States. So far as the Korean campaign in itself is concerned, its provisioning presents no visible problems with which the oil industry cannot cope by calling into play some of its reserve facilities.

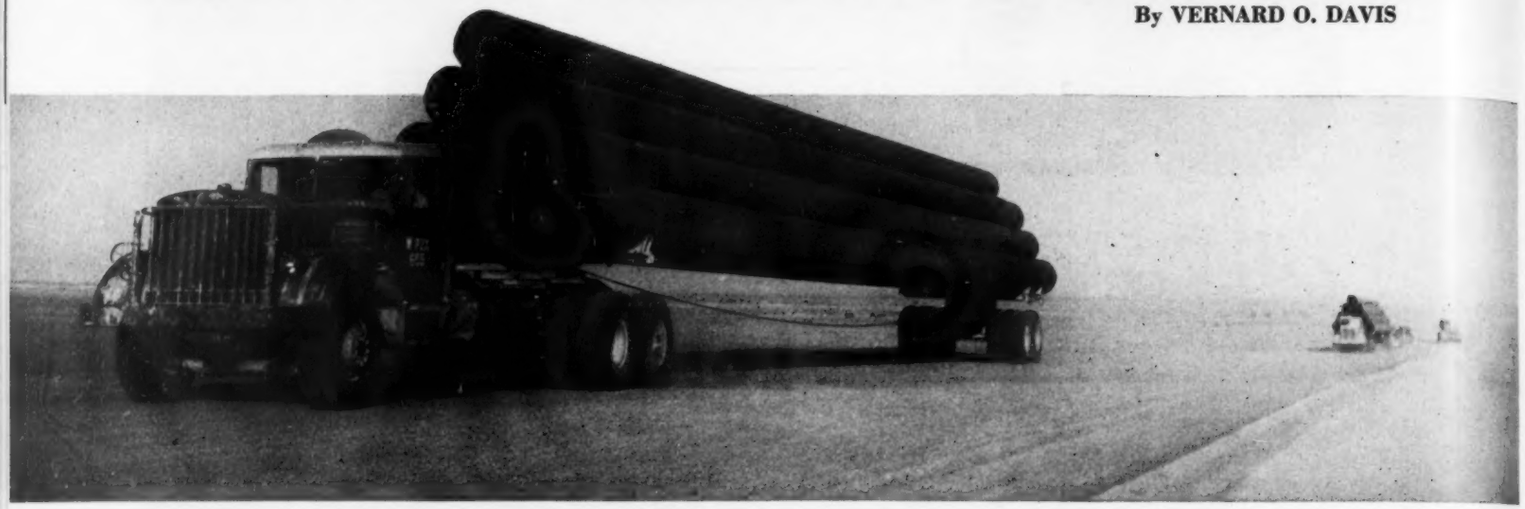
Indirect results of the Korean outbreak seem likely to exercise greater long-term effect on oil than the conflict in itself. It has led to more energetic action on the part of the United States in putting its own defense establishment in a state of more effective preparedness. It also has stimulated prompt action in the preparedness program of the nations included in the Atlantic Union. This means more planes, more ground equipment and more stockpiling of many kinds of supplies including petroleum products.

Implications of the display of Communist force are such that the non-Communist nations are compelled to put themselves in position to resist further aggression. It is agreed by military experts that a war of world dimensions involving operations in both hemispheres would require the use of two to three times the amount of oil used in World War II, due to multiplication of planes and high-powered weapons that would be brought into use. In order to be in a fair way to meet such a contingency, it is necessary for the oil industry to maintain an intensive campaign of exploration and test drilling in order to expand available reserves, to add largely to existing transportation facilities and to enlarge refining capacity, which at the present time is no more than is necessary to meet current requirements measured by safe operating standards.

Fortunately activity in all these fields is now at a high level and is planned to move forward at an accelerated pace. In any plans that may be adopted for industrial mobilization, it is essential, therefore, that provision be made to insure that the oil industry will be supplied with the materials and equipment necessary to the continuing expansion of its resources and facilities. While it is possible to shift many kinds of manufacturing establishments from one form of production to another or even to erect new plants for temporary service on relatively short notice, it is not possible to discover new oil reserves except by long and expensive search, nor to provide safe means of transportation quickly, nor even to construct complicated modern refineries capable of supplying the specialized forms of fuel demanded by continual advance in martial equipment. While oil is only one of many requirements of modern warfare, it is among the most essential, and this fact should not be overlooked in planning for the future.

Tapline In Final Construction Stage

By VERNARD O. DAVIS



Forty-ton load of pipe consisting of ten 93-foot sections of pipe carried by a 300-hp tractor-trailer combination. Photo by Richard Finnie for International Bechtel, Inc.

Vernard O. Davis, author of the accompanying article, has been intimately connected with the Trans-Arabian Pipe Line project since the early stages of its construction. He went to the Middle East in 1947 as materials coordinator for Bechtel International Corp. In 1949 he transferred to Tapline's engineering department to help expedite shipments.

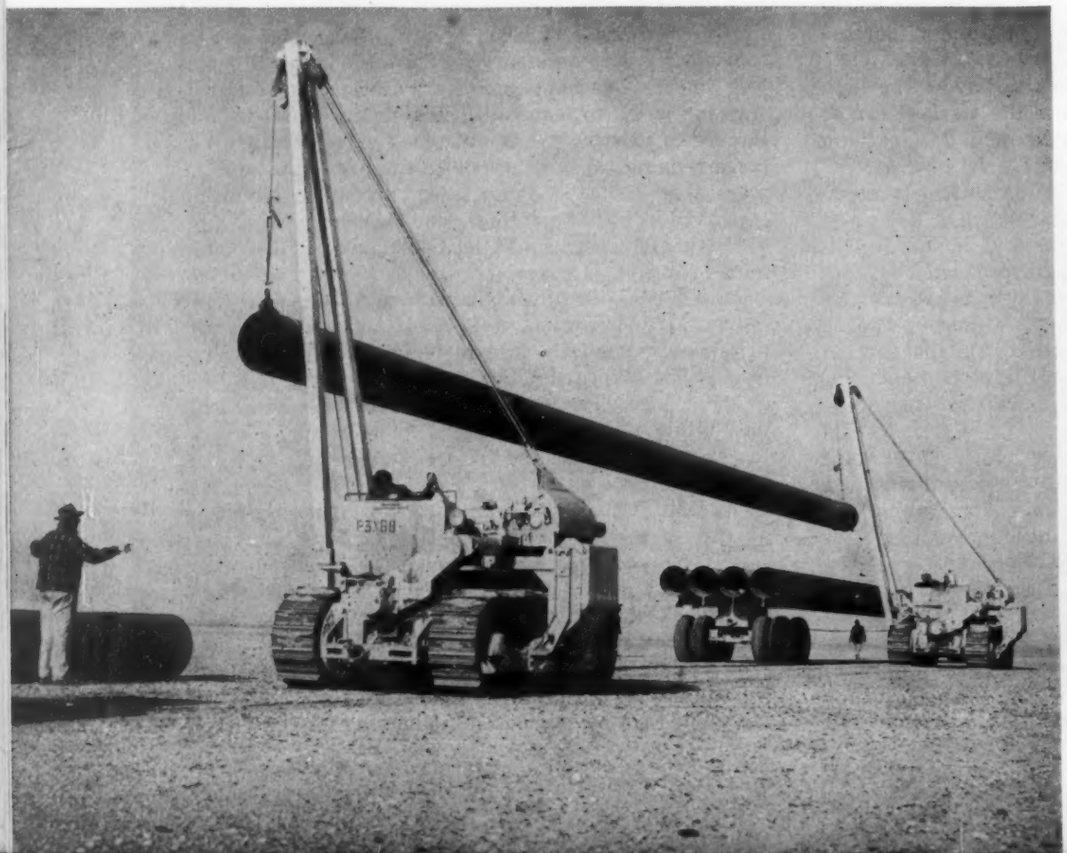
Prior to World War II Mr. Davis was with Pacific Gas and Electric Co. in California. During the war he served as an officer in both ordnance and artillery units, rising to the rank of Lieutenant Colonel.

TRANS-ARABIAN Pine Line Company's project is rapidly nearing completion. Within the next few months Saudi Arabian oil will be 2,600 miles nearer to European markets than it is today.

For those who missed the opening story of Tapline*, we are referring to the 1,068-mile, 30-31-inch pipeline which includes Arabian American Oil Company's 315-mile gathering system from Abqauq via Qatif and Abu Hadriya to Qaisumah. It runs northwesterly

*World Petroleum, September 1949.

Two "cats" lift 93-foot sections of 31-inch pipe in pipe stringing operation. Trans-Arabian Pipe Line Co. photo.



At the eastern end of the line pipe was unloaded on a sea island three miles offshore and carried to the mainland by a skyhook. Tapline photo.

across the northern part of Saudi Arabia, through Jordan, Syria and Lebanon to a terminus near the ancient city of Sidon on the Mediterranean coast.

The last joint of pipe is expected to be tied in during the first part of October. Qaisumah pump station is complete except for control panels and a few minor installations. Badanah and Nariya pump stations should be completed by October and November respectively. Pumping of oil has already been started eastward from Qatif, and final completion of these three pump stations will enable oil to reach the Mediterranean terminal in December at the rate of over 100,000 barrels daily. Thereafter, pump stations at Rafha and Turaif will go on stream, so that the designed throughput capacity of 315,000 barrels daily can be achieved by January 1, 1951. Tanker loadings at Sidon terminal are scheduled to commence on that date.

The chief dispatcher in Beirut will direct the control of oil flow through each pump station into the terminal tank farm, consisting of sixteen 180,000-barrel oil storage tanks. Four crude oil submarine loading lines and four bunkering submarine lines run approximately one mile offshore to the ship moorings.

Initially, the line will be operated with a 96,000-barrel tank "floating" on the suction of each station except Qaisumah. At Qaisumah station six 180,000-barrel tanks will be used to receive the incoming oil from Aramco's gathering system, at which point the oil will be gaged for royalty payments to the Saudi Arab government.

Tapline has prepared an operations training manual and is now conducting a training program to acquaint station operating personnel with the characteristics and layout of the stations. This should materially cut the familiarization time required for smooth, efficient operation.

In order to provide adequate and reliable communications for operations control, the Radio Corp. of America has designed and is installing the latest types of communications equipment for Tapline. For pumping and pipeline control use, high frequency channels are being used with rather unique circuit arrangements. To reduce the maximum operating distance and to minimize the effect of variable atmospheric conditions (movement of the Heaviside layer), a relay radio has been set up at the pump station nearest the center of the line. Two-circuit communication is maintained between Sidon terminal and the relay station, which in turn transmits to the stations on either side of it on two frequencies, used simultaneously because of multiple distances. The stations transmit to the relay station on a single frequency, whichever of two is most appropriate for favorable transmission at the time of call, as their transmission distances are fixed. This system provides a "party line" type of communication and makes "conference calls" possible.

In addition a circuit is provided for point-to-point communication between any two stations for general pipeline operations use. Two additional circuits provide duplex telephone and radio teletype service between Beirut, Sidon and Qaisumah, primarily for management and supervisory functions. The duplex telephone and radio teletype service is set up to be operated independently and simultaneously by means of frequency shift keying on the teletype. To facilitate operations and control of pipeline patrols and company aircraft, circuits are provided for communications, and short-range navigation beacons are installed at most of the pump stations.

Because of the occasional heavy dust storms or "shammals" wherein visibility may be reduced to 25 or 30 feet and dust finds its way into every crack and crevice, all of the radio equipment has been sealed or designed with dust-proof gasketed doors, and even air conditioning for the sets is included where necessary. Custom built controls have been provided to insure simplified operation for the non-technical personnel who will normally use the equipment. Operation is generally no more difficult than the use of an ordinary telephone, or at most, a small telephone switchboard.

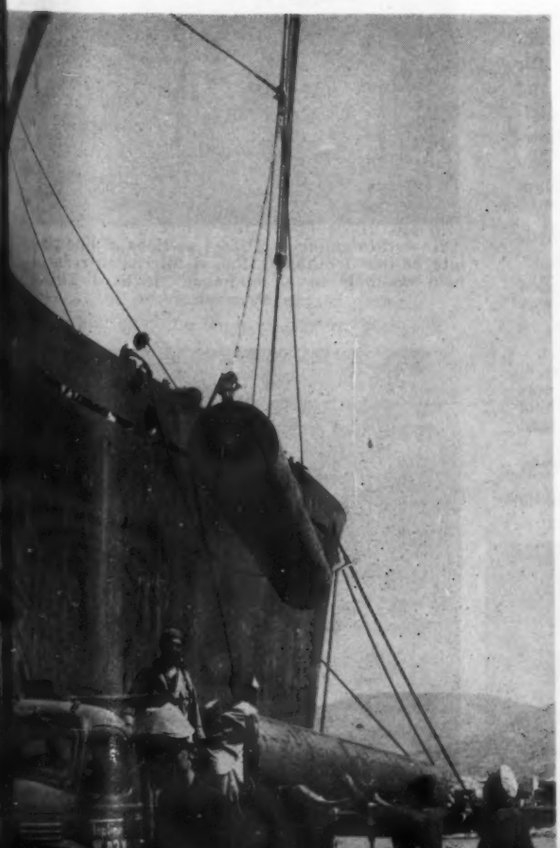
In addition to special adaptation and design of the radio receivers and transmitters, great care and consideration have been given to the design and installation of the latest types of antennas. Antennas are designed in the field and installed for miximum efficiency at each location, and here, as throughout the radio industry, antenna design has been found to be of critical importance. It has been found that the high static-noise level occurring during the shammals can be materially reduced by insulating the wire and lead-ins of the receiving antennas, without noticeable decrease in signal strength.

It is believed that Tapline involved the biggest transportation and trucking job of any pipeline project yet undertaken, requiring over three billion ton-miles of ocean shipping and approximately 150 million ton-miles of field trucking.

The fabrication and shipment of main line pipe was in itself a huge undertaking. The final shipment of pipe departed from Long Beach on June 30 and arrived at Beirut on August 8. This program involved total shipments of 206,000 tons of pipe to the Persian Gulf and 59,000 tons to Beirut—a combined total of 265,000 tons of 30-31-inch pipe.

Another large-scale undertaking was the procurement and training of native labor. The training of Arabs has been carried on throughout the construction period, and increasing use has been made of their newly-developed skills. At one peak period as many

At the western end of the line it was possible to unload pipe directly from ships to trailers for stringing in the field. Tapline photo.



Lining up two sections of pipe for welding in the field. The device employed in bringing the two ends of pipe together accurately has done much to expedite field work. Tapline photo.

as 14,000 nationals of the countries traversed by the pipeline were employed on the project. For comparison, at peak construction Tapline employed 1,700 Americans in both domestic and foreign service. Arabs have been trained in such jobs as cooking, baking, first aid, sanitation, welding, rigging, wire-rope splicing, truck driving and equipment handling. In fact, there was hardly a trade used on the job in which Arabs were not utilized, and many of them became expert artificers.

To provide water the construction crews and pump stations, over 50 water wells have been drilled along the line. In the shallower wells where the water level stands between 150 and 300 feet, shaft-driven, deep-well turbines powered by gasoline engines or electric motors have been used; and in the deep wells where the water level is from 300 to 1,000 feet, long, small-diameter submersible motor-pumps are used. At pump stations watering troughs have been provided for the use of the Bedouins who had been almost entirely dependent on the scanty rainfall or on primitive, hand-dug wells for the survival of their families, flocks of sheep and herds of camels. The water in all but a few wells is somewhat salty and has a fairly high percentage of dissolved solids. In addition the pipeline roads have proved to be of great value to the Arabs.

The completion of this job has been facilitated by ingenuity and a willingness to utilize or adapt new methods. An example is the adaptation of techniques from other fields, such as the use of the logging industry's so-called "skyhook" cableway system for more efficient handling of materials. This was used at Ras el Mishaab, Saudi Arabia, to move the main-line pipe a distance of three miles from the offshore man-made Sea Island, where deep-draft freighters were offloaded, to the denesting and pipe-jointing plant storage yard, thereby saving men and equipment which otherwise would have been required to move pipe and other materials by shallow-draft lighters. Another example is the use of automatic welding machines for multiple pipe-pointing. This allowed the pipe to be hauled to the line in 93-foot sections, instead of the mill-run, 31-foot lengths, and, at the same time, cut the number of manual welds to one-third.

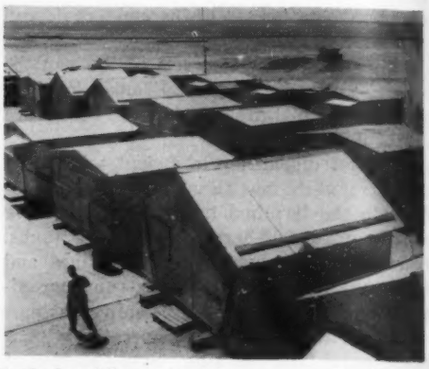
Radio-active materials have been utilized to insure efficient welds. About one out of every 20 were photographed by gamma-rays from radium sulfate capsules inserted inside the pipe where a joint was to be tested. A strip of this film was wrapped around the pipe at the weld, and the gamma-rays emitted by the capsule exposed the film to give a picture of any flaws which might be a source of trouble.

In addition, radio-active materials are being used in another manner. Scrapers or "pipe-pigs" are being run through the line to clean out sand and miscellaneous debris which may have accumulated during construction. To locate these scrapers, capsules of irradiated cobalt (Cobalt-60) are placed in them, and by the use of a Geiger counter the pigs' location in the pipe can be determined when desired. This is particularly helpful if the pig should get stuck somewhere along the line.

The requisitioning and procurement of equipment and materials for the project has been a major undertaking. Even before the construction of the pipeline was begun, some 1,500 requisitions for construction supplies and equipment had to be written. These were mainly for basic facilities required for construction of the pipeline and pump stations, such as the construction of the port and base camp at Ras el Mishaab on the Persian Gulf, including pipe-jointing and warehousing facilities. During the construction period approximately 5,000 additional requisitions have been processed. Of these, about 70 percent were for materials to be used in permanent construction, and about 30 percent were for construction tools, equipment, spare parts and food. Of the latter group, one of the requisitions for spare parts listed 1,944 items; however, the average spare parts' requisition was for about 88 items. Food requisitions averaged about 164 items per requisition.

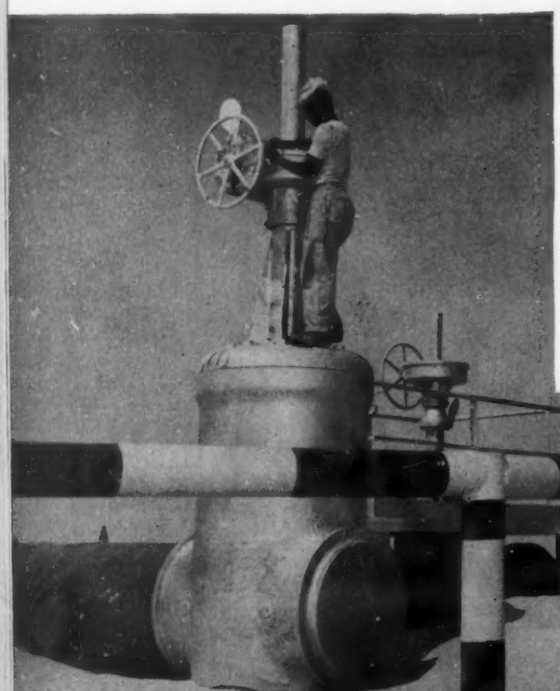
Field construction is progressing on schedule. Unless unforeseen developments occur, the first oil from Arabian fields will be loaded into tankers from the ancient Phoenician port of Sidon on January 1, 1951.

Pump station under construction at Turaif on the high central Arabian plateau. Like other Tapline stations Turaif will be a complete community with all amenities for comfortable modern living. Photo courtesy Graver Construction Corp., builder of this particular station.



Typical mobile construction camp on Tapline. All buildings can be mounted on trucks and carried away quickly. Photo by Richard Finnie for International Bechtel.

Automatic welding of 31-foot sections of line pipe into 93-foot lengths at Ras el Mischa'ab reduced field welding to a minimum. Richard Finnie photograph.



Fourteen-ton valve at Gatif junction. Tapline photo.

Although 30 and 31-inch sections of pipe were nested to increase steamer loading it still was possible to carry a deck load as well as a hold full. Photo shows final shipload ready to sail from Long Beach, Calif., June 30, 1950. →

Washington

Oil Industry Moves Forward with Plans For Emergency

By JOSEPH B. HUTTLINGER

AMID the general confusion that has ruled Washington during the past month with the lack of any coordinated control over preparedness activities, the cross-currents of controversy among government agencies as to which shall have control of various necessary activities and the apparent absence of a comprehensive defense program such as was supposed to be in preparation since the end of World War II, the oil industry stands out as a notable exception. Through the National Petroleum Council and other oil industry organizations, the government is being informed promptly of the industry's ability to increase production, to supply special products for which there is immediate need and of the industry's requirements in order to maintain its efficiency and to meet possible enlargements of demand.

Reports from producing areas presented at the meeting of the Interstate Oil Compact Commission at its meeting last month showed that crude output in the United States could be raised approximately a million and a half barrels daily without injury to the ultimate recovery from existing wells. The information thus collected is being supplemented by a detailed survey by the National Petroleum Council to determine where increased production can best be obtained as needed. The special committee of the Council which has been making a continuing study of possible military requirements in the matter of oil takes into consideration not only domestic resources but also present and potential supplies from outside sources.

The session of the Council which met in Washington late in July was held in an atmosphere that was predominately one of war preparedness and significantly was attended by W. Stuart Symington, chairman of the National Security Resources Board. In addition to its long standing committees, including those on military needs and steel requirements, other committees have been formed to deal with other subjects including transportation and storage. The chairman of the steel committee submitted a preliminary report some time ago, but the committee has since had a meeting at which it appointed subcommittees and launched studies to provide an exact estimate of the oil industry's steel requirements over the next 18 months.

One of the immediate needs of the current situation, which is the subject of study and to which Secretary of the Interior Chapman has called the attention of the industry as a whole, is the provision of increased quantities of aviation gasoline. In a statement issued on August 11, the Secretary urged the petroleum industry to eliminate the use of alkylate in motor gasoline and to employ it in the production of aviation gasoline. He repeated a request that alkylate plants be operated at full capacity and that the production of grade 115/145 gasoline be substantially increased. On the basis of current trends, the Secretary stated, the demand for aviation gasoline by the first of the year will require increased production of aromatic blending materials. The Military Petroleum Advisory Board has informed Secretary Chapman that on a nationwide basis the production and blending into aviation gasoline of one thousand barrels per day of toluene would be equivalent to increasing alkylate production by almost 2,800 barrels daily.

While a larger supply of these components is a matter of importance, it imposes no serious problem. By enlarging the output of plants now operating or by activating government owned units now on a standby footing, it will be possible to step up production. At the utmost the effect of heavier demands for military use would involve no more than a cutting down in the use of blending agents in gasoline for private car operation.

Linked with the emergency, though of minor importance at the moment, is the issue of oil production from underwater lands bordering the Gulf and West coast of the United States, where oil drilling is going on. With the final outcome of the struggle between the states and federal government for control of the lands still undecided, both sides in hearings held in the latter half of August argued their claims to control in the interest of national defense. Senator Joseph C. O'Mahoney (D., Wyo.) is pressing upon Congress a compromise interim bill to permit drilling to go on until Congress can resolve the problem once and for all next year.

Passage by Congress on August 10 of the bill giving the President authority to allocate materials, including steel, to industries essential to defense and national security, to requisition supplies needed by the government, to loan up to two billion dollars to industry to expand production of war requirements and to invoke wage and price controls as needed, puts in the hands of the Chief Executive even more sweeping powers than he asked for. So far as the oil industry is concerned, the feature of the law which appears of most immediate consequence is that relating to allocations, particularly of steel. In order to continue drilling at the rate of 40,000 wells annually, which is considered necessary in order to maintain a safe reserve in view of the heavier rate of withdrawal, a large tonnage of structural steel, casing and drill pipe is essential, as well as line pipe for transportation and metal parts for processing and storage expansion. With authority in the hands of the administration, assurances have been given that the needs of the oil industry will have full consideration.

Aside from meeting mechanical needs, a consideration of equal importance to the oil industry is the retention of sufficient manpower to meet its obligations. In the list of occupations drawn up for the guidance of draft boards in considering deferments, drillers and others engaged in oil production, workers engaged in transportation of oil and gas and skilled refinery employees are included. These lists are advisory, not mandatory, but unless the demands for military service become heavier than now anticipated, they should enable the oil industry to retain a majority of its skilled workers.

Actual effect upon the oil industry of the new economic powers conferred on the President may be relatively slight, because of the reserve capacity built up by the industry and the excellent state of its equipment. Oil men generally express confidence that they can provide the products needed with no resort to civilian rationing. If so, the chief effect of the recent legislation may be to channel to it steel and other critical materials needed to help it do its job. Of course, all forecasts of future developments are made with the reservation that the situation may change at any moment.

General view of refinery showing boiler plant and crude distillation unit. All photographs with this article are by Mary Saint Albans, Mexico City.

Mexico's Distribution Problem Eased By New Salamanca Refinery

By Ing. Rafael Ortiz Mena

In earlier years domestic demand for oil products in Mexico was very small, consisting principally of fuel oils for use by railroads, which demand was easily satisfied, since delivery of the product was made f.o.b. point of production. More recently, however, the construction of new highways and the establishment of new industries, particularly in the suburbs of Mexico City, brought about a considerable increase in the consumption of gasoline and industrial fuels. This resulted in the installation of a refinery at Atzcapotzalco of sufficient capacity to satisfy the demands at that time. Gasoline consumed in this territory was furnished by different companies and was refined at this plant.

When the petroleum industry was nationalized in 1938, Pemex found doors to the export markets were closed, so activities of the industry had to be modified on the basis of internal needs. Operations of Pemex had as their aim the gradual change in refining, sales and distribution systems to adapt them to national requirements. Of course, at the start of operations Pemex found a great discrepancy between the national demand and the company's distributing facilities. Later on many of these difficulties were overcome, and plans were made to reconcile the increasing demand for petroleum products with adequate and economical distribution methods.

During the past twelve years national demands for the principal petroleum products have grown rapidly, as may be seen in the following table:

	1938		1949		Percent Increase
	B/D	Percent	B/D	Percent	
Gasoline	9,047	15.9	33,776	24.9	273
Kerosene	2,281	4.0	10,520	7.8	361
Gas oil	2,274	4.0	9,169	6.7	303
Lubricants	618	1.1	2,630	1.9	325
Fuel oil	42,692	75.0	79,339	58.7	86
Totals	76,912	100.0	135,434	100.0	77

Fuel oil represented 75 percent of Mexican oil consumption in 1938. Approximately 60 percent of this fuel was used by the railways and the remaining 40 percent by other industries. Coal resources in Mexico are barely enough to cover the requirements of the metallurgic industry of the country. Therefore, coal is practically unknown as a primary fuel for general use, petroleum or its by-products being the only basic fuel consumed; hence, its supply is of paramount importance both to railroads and other industries, because without it all basic and indispensable

Rafael Ortiz Mena was born in Mexico, graduated in chemical engineering at the National University of Mexico, and is well known for his technical studies and investigations. He worked in radioactive research for the Mining Institute of Mexico. For more than fifteen years he has been associated with Petroleos Mexicanos. During this time he has been active in many technical and engineering matters concerning refineries, production and other petroleum problems. For much of the past seven years he was in the United States developing petroleum projects for Petroleos Mexicanos. He directed the engineering and purchasing of materials in the United States for three recently-built large refineries in Mexico. His contribution to and interest in a broad program for the development of the Mexican oil industry represents a remarkable achievement.

activities would be paralyzed. Consequently the operations of Pemex refineries are aimed at high fuel oil production and low distillate production, a tendency contrary to that existing in other petroleum producing countries.

In 1938 gasoline represented 16 percent of the total consumption; in 1949 it had risen to 25 percent, making an increase of 73 percent in the use of this product. This reflects the enormous development of the transportation industry and has improved both the operating conditions of the refineries and the benefits from the distribution of their products. Gains in this direction will proceed even more rapidly in the future.

Since about 60 percent of the fuel oil output is consumed by railways, as stated, and since such consumption has been nearly constant for many years, the increase in this category appears rather low. Closely related to this item is the marked increase in gas oil consumption, which rose 303 per cent, reflecting the introduction of diesel locomotives in the national railway system and the increased demand for gas oil from agriculture and industry.

To meet increasing national demands, Pemex has three refining centers located in Tampico, Minatitlan and Atzcapotzalco. These refineries ship direct to distributing agencies or through terminals which, in turn, deliver the products to final distributors. The capacities of the refineries located at these centers is as follows:

Refinery	Daily Capacity in Barrels 1948	1949
Ciudad Madero	43,000	62,000
Arbol Grande	11,500	19,000
Mata Redonda	8,000	9,000
Minatitlan	27,000	24,000
Atzcapotzalco	11,000	50,000
Poza Rica	—	6,000
Totals	100,500	170,000

Comparisons of the total capacity of refineries located on the coast with that of the refinery at Atzcapotzalco (inland) gives the following percentages:

Refinery	Capacity	Percent
Coastal area	120,000	70.6
Central area	50,000	29.4

In comparison with this division of refinery capacity, the distribution of demand for petroleum products by areas is as follows:

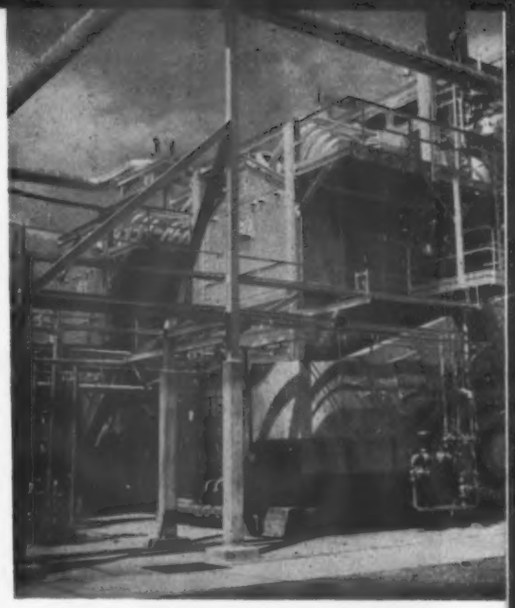
Zone	Percent Consumption
Tampico	5.3
Vera Cruz	9.1
Minatitlan and Yucatan	4.1
Pacific Coast	9.5
Federal District	39.7
Bajio	10.5
Guadalajara	4.0
Chihuahua and Torreon	9.9
Monterrey	7.9
	100.0

Consolidating these consumption percentages in two great zones, the first comprising the coastal area and the second the central and north plateaus, gives 28 percent for the coastal areas and 72 percent for the central region.

Of the coastal zone figure, 18.5 percent of the national demand is in the Gulf coast area and 9.5 percent in the Pacific coast area. This circumstance illustrates the unfavorable conditions under which the industry is operating —to satisfy the central area demand for 72 percent of the products, there is available a refining capacity of only 29.4 percent.

Up to the present time the national railroad system has been the principal means of oil transportation. Since it was the weakest link in the distribution system, various other methods had to be used to effect delivery of the ever-increasing volume of petroleum products.

Marine terminals were constructed in order to bring these products closer to consumption centers. Such terminals were located at Matamoros and Campeche on the Gulf coast, and at Salina Cruz, Acapulco and Punta Prieta on the Pacific coast. In the meantime the number of railway cars in service was increased from 1939 to 1944. Despite the increase in cars and in the number of their trips per month, movements of freight by rail became more congested every day. A solution was needed that would not only improve the position of the petroleum industry but would also improve transportation conditions all over the country.



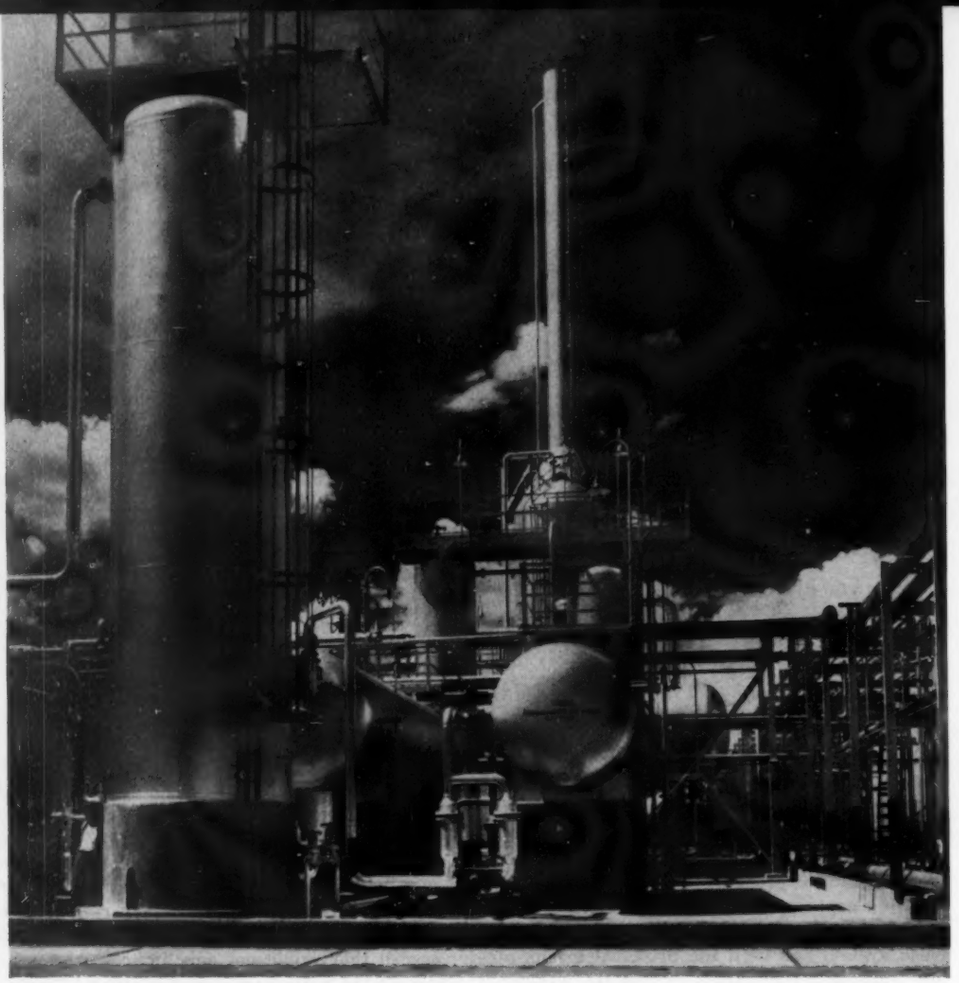
Boilers in refinery steam plant.

Aside from the inadequacies of the railway system in the movement of petroleum products, there were three other factors contributing to the transportation problem: (a) concentration of demand; (b) points of production, and (c) topography of the country.

The factors (a) and (b) are interrelated. The demand for supplies of petroleum products ultimately reverts to the point of production. If it is within convenient access to centers of consumption, distribution will not be hampered. As has been noted, the bulk of the refining facilities are located on the Gulf coast, with only one refinery in the central region. Refineries in the Tampico area have had to depend on rail service to effect deliveries in distant points such as Guadalajara, Oazaca, Tepic and others. The refinery at Atzcapotzalco, limited by its own capacity and by the pipeline from Poza Rica, which supplies its raw material, has had to restrict its marketing areas. Prior to its recent expansion, in fact, its radius of distribution had been reduced practically to the Federal District, and even there it depended on the aid of the Tampico and Minatitlan refineries to meet its demands.

Due to the market and topographical peculiarities of the country, the transportation and distribution of petroleum products should radiate from the center to the periphery instead of converging from the periphery to the center, the condition under which Pemex has been compelled to operate. It is far easier, safer and more economical to reach the heights of the central plateau by pipeline than by rail; likewise, it is easier, faster and more

Tank car and general repair shop at the Salamanca refinery is said to be the most modern in Latin America.



Portion of treating facilities for crude distillation products, i.e., gasoline and kerosene.

economical to ship by rail on down grades or level ground than on upgrade. A revision of transportation and refining facilities independent of the railways offers advantages.

Expansion of the Atzcapotzalco refinery marked the first step toward the solution of this problem. The territory served by this refinery was expanded considerably to include distributing agencies located in the central zone formerly served by Tampico, Vera Cruz and Manzanillo. As the demand for petroleum products kept on increasing rapidly, however, its outlying agencies reverted to service by Tampico and Vera Cruz. At present only a small percentage of the fuel oil consumed by the national railways throughout the central zone comes from Atzcapotzalco refinery, the bulk being supplied by Tampico refineries.

The figures relating to the concentration of demand for petroleum products indicate the great importance of the Bajio district, the lowland region which is Mexico's fundamental agricultural zone. A logical step following the expansion of Atzcapotzalco was the erection of another refinery to meet the demands of this important zone. A search was started for a suitable location, and after a careful study it was decided that Salamanca (State of Guanajuato) was the point meeting all the requirements.

The Salamanca refinery, therefore, represents Pemex' second definite step toward reconciling production conditions with distribution problems. However, it should not be assumed that with the erection of this refinery all problems have been solved, as this is only a part of Pemex' development plans.

With the construction of Salamanca, the refining capacity in the central district has been increased to 40 percent of the industry's total refining capacity and will create a more equitable relation between geographical demands and refining potential. The new refinery will assume the distribution of petroleum products in the entire central zone, including some agencies presently supplied by Atzcapotzalco. It will also supply railway branches which Atzcapotzalco has been unable to serve. This will result in an improvement in the present distribution system in several respects, since the new refinery will supply many agencies formerly served by Tampico.

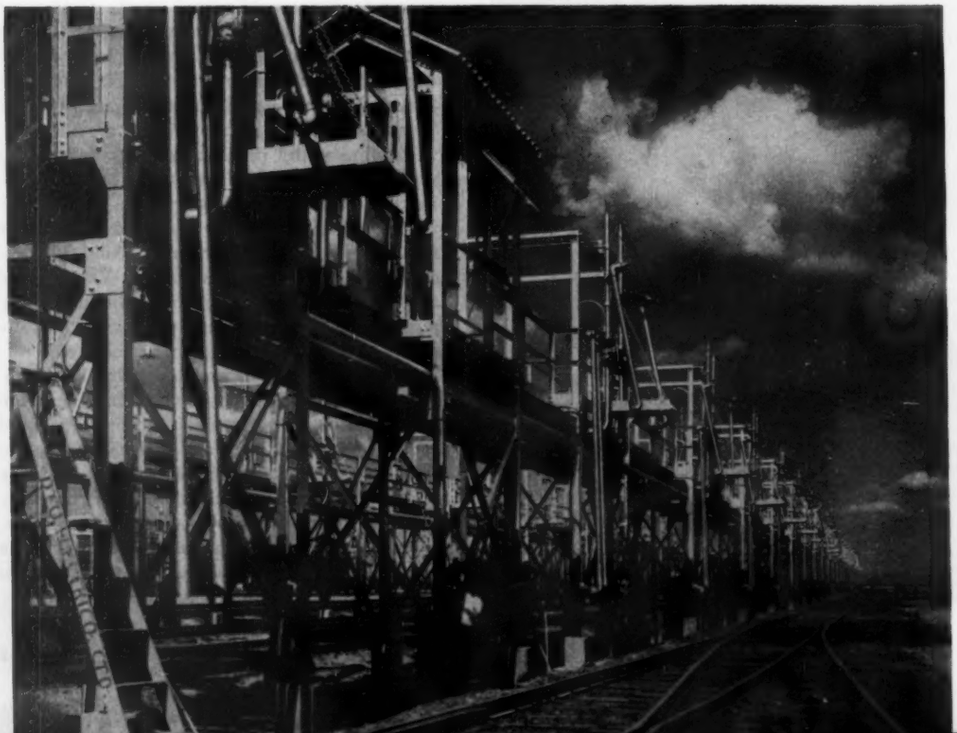
In addition to the central zone, the Salamanca refinery will serve part of the country's northern zone, which distant territory must be served by some other means in the future. With the idea of solving this problem, Pemex' plans include the early erection of another refinery in some important northern locality. Finally, with the aim of creating a better distribution system in the Pacific coastal area, Pemex plans to establish a refinery in some Pacific port better situated to permit the economical inflow of raw material and the outflow of finished products.

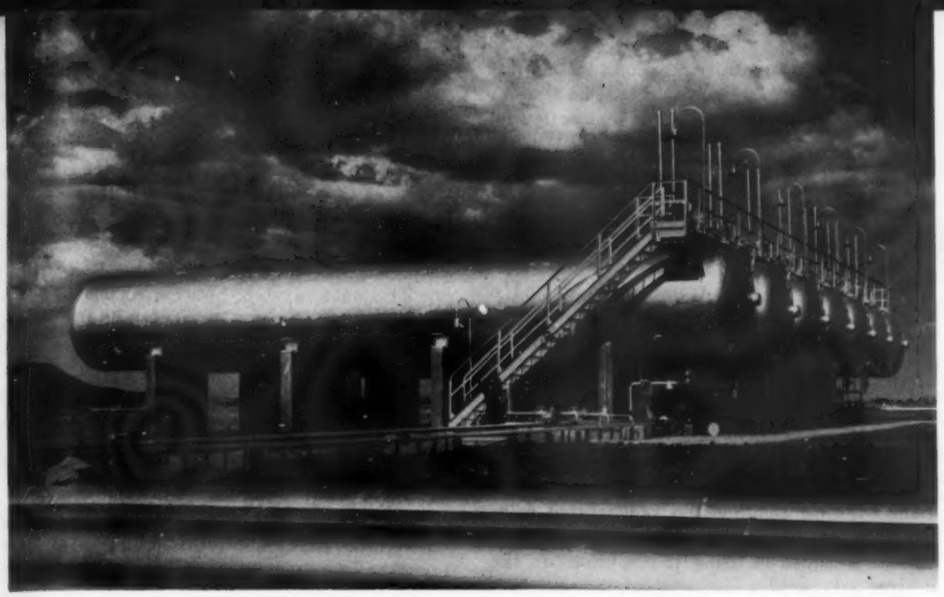
The overall program already in progress will continue as rapidly as possible according to plan and subject to conditions imposed by present producing fields, new fields and national and export demands.

Crude for the Salamanca refinery will be delivered by a pipeline 279.6 miles long, starting from the Poza Rica field and running parallel to the Poza Rica-Atzcapotzalco pipeline up to a point near Beristain, where it branches off to continue south of Pachuca toward San Juan del Rio, Queretaro, Celaya and finally to Salamanca. The starting point of the pipeline at Poza Rica lies 180 feet above sea level, reaching Salamanca at 5,249 feet above sea level. The highest elevation of the line is found just before reaching Pachuca, which lies 8,530 feet above sea level.

The common route of the first 68 miles has made it possible for the Salamanca pipeline to utilize the pumping stations of the Mexico City pipeline, offering a number of advantages. There are seven pumping stations equipped with electrically driven reciprocating pumps which will make it possible to pump 22,500 barrels per day. In the future

All steel loading rack with loading spots for 86 cars.





LPGas storage tanks.

this volume will be increased to 30,000 barrels and eventually to 60,000 barrels, through amplifications of existing installations.

The pipe used in the first 217 miles was manufactured in Mexico. Only the pipe for the last 62 miles leading to Salamanca was imported, due to the element of time in completing the project. It is also interesting to note that the last pumping station of this pipeline is located 68 miles from Poza Rica, meaning that the oil is pumped from there direct to Salamanca, a distance of 211 miles, without other intermediate stations. This probably is one of the longest distances over which oil has been moved by a single pumping station, which has been made possible by the topographical conditions of the terrain.

Prior to the erection of the Salamanca refinery, the community was not equipped with adequate sources of power, housing for employees or necessary utilities for a modern industrial project. To supply these deficiencies an integrated plan was adopted which embraced the erection of a colony for employees with water and electrical systems as well as offices, laboratories, process equipment and other auxiliaries. The whole project constitutes a model for the petroleum industry.

Like its predecessor at Atzcapotzalco, the Salamanca refinery was engineered by Arthur G. McKee & Co. and erected under the supervision of McKee and Pemex engineers.

Capacity of the refinery is 30,000 barrels daily when operating on Poza Rica crude. Products are LPGas, premium and regular grades of motor fuel, all types of kerosene, gas oil and fuel oil.

Process units incude a crude still, a naphtha stabilizer, a thermal cracking unit and vapor recovery system, treating units for LPGas, naphtha, gasolines and kerosenes, and a regenerator for recovery of treating chemicals. Auxiliaries include the steam system and power plant, water system, fuel system, pumping equipment, tank farm, offices, laboratories and other service buildings.

The plant was designed to provide the greatest possible flexibility. While Poza Rica crude will be processed at the outset, the characteristics of the raw material may vary widely, depending on the quantity of light fractions blended with the crude at the field stabilizer and natural gasoline recovery plant. If demand for motor gasoline in the area economically served by Salamanca rises to 11,000 barrels daily, the plant will be capable of handling 30,000 barrels of Poza Rica crude mixed with natural gasoline. If demand for gasoline is on the order of 7,000 barrels daily, the plant can process 26,000 barrels of stabilized Poza Rica crude without the admixture of natural gasoline. If it is desired to process raw crude, the plant can handle 22,000 barrels daily, and the production of gasoline will not exceed 5,000 barrels daily.

These examples give an idea of the flexibility of the refinery which will permit the processing of a great variety of mixtures of crudes according to the demand for products in the territory which has to be supplied. Naturally the maximum use of the installations will be obtained when enriched Poza Rica crude is processed with the object of obtaining the largest cut of gasolines.

In the same way that the charge to the refinery can be varied in accordance with the amount of light products in the crude, it is likewise possible to alter the yield of final products by changes in the method of plant operation. It is possible to charge all of the gas oil from the crude still to the cracking unit, or part may be withdrawn for sale and the cracking unit fed with a variable mixture of gas oil and reduced crude. Final result of this operation is to regulate the production of refined products in accordance with demand.

As an example, assume a run of 21,000 barrels daily of enriched Poza Rica crude. In this case the cracking still charge would consist of a mixture of 1,737 barrels daily of gas oil with 2,803 barrels daily of reduced crude. With catalytic desulfurization and stabilization, it is possible to obtain 2,673 barrels daily of high test gasoline and 5,534 barrels of motor fuel. It is possible also to decrease the production of high test and increase the production of regular grade gasoline by as much as 2,005 barrels daily. This example will serve to illustrate the high degree of flexibility which has been built into the plant.

The primary distillation unit is designed to run a minimum of 20,000 and a maximum of 30,000 barrels of crude daily. As explained above, it is possible to regulate the throughput in accordance with the character of crude to be processed. Assuming that the unit operates at a 26,000-barrel rate, the naphtha production may vary from 5,000 to 9;700 barrels daily, depending on the degree to which the Poza Rica crude is stabilized in the field.

Principal equipment of the unit is a duplicate of the existing "18th of March" refinery at Atzcapotzalco. This will make it much easier to maintain adequate replacement parts and to maintain the unit properly.

Crude which comes from Poza Rica through the pipeline is stored in five working tanks which are always connected with the crude supply. From these tanks the raw crude is pumped to the crude still through a battery of heat exchangers in which it picks up heat from finished kerosene, gas, oil and residuum. When it leaves the battery of exchangers, the crude is flashed into a bubble tower at 350°F. In this tower the lightest portions of the charge are removed including all dissolved gases. Crude from the base of the tower is charged through two parallel coils in the heater and transferred to the principal fractionating column at 597°F. Four streams are taken from this tower. The overhead product boils in the gasoline range. After condensation, part serves as reflux in the same tower, another small part is used as reflux in primary tower previously mentioned, and the principal stream is pumped through a condenser to aid in recovery of the volatile fractions from the bubble tower. The final product obtained here is naphtha which is passed directly to the stabilizer. The naphtha may be desulfurized alone or mixed with cracked gasoline and blended with TEL to produce specification motor fuels.

The kerosene and gas oil side streams which are obtained from the fractionating column are processed further to bring them to desired specifications. The final product of the column is residuum which is removed from the bottom. Part of this is blended with gas oil as fresh feed to the cracking unit, and part is blended with cracked residuum for sale as industrial or railroad fuel .

The stabilization unit is designed to process the naphtha obtained in the primary distillation unit or mixture of this naphtha with cracked gasoline. In the first case the naphtha can be transferred directly from the primary distillation unit or moved to the plant after chemical treating. In the event that the naphtha is mized with cracked products, it is charged to the stabilizer after catalytic desulfurization.

Equipment employed in this unit is very simple, and its operation is as follows: The charge is introduced into the stabilizer tower passing first through a heat exchanger in which the temperature is raised by heat given up by naphtha withdrawn from the base of the tower. Vapors separated in the tower consist of H_2S, propane and lighter hydrocarbons which are passed through a condenser and are received in a reflex accumulator. All of the products not condensed are separated in this accumulator and enter the general refinery fuel system. Part of the liquid is used as reflux for the tower, and the remainder is pumped to pressure storage.

Part of the stabilized product from the base

of the tower is recirculated through a direct-fired heater, and the remainder, as mentioned above, is withdrawn from the tower, passing first through the heat exchanger against the cold charge and then through a cooler before running to storage.

The thermal cracking unit employs the Dubbs cracking process. It was designed to process 4,000 barrels daily of gas oil or a mixture of 3,000 barrels of gas oil and 1,540 barrels of reduced crude obtained in the primary distillation unit. Probably the unit will be able to operate satisfactorily on a charge consisting entirely of reduced crude in quantities as high as 5,000 to 6,000 barrels daily. In this event the production of cracked gasoline will be less than 2,000 barrels per day. Without doubt this plan will be followed in case enough gas oil is not available for cracking.

The catalytic desulfurization unit was constructed under Phillips Petroleum Co. patents. This process employs the catalytic conversion of organic sulfur compounds which form sulfuric acid and a product highly susceptible to TEL. The conversion is in the vapor phase at a temperature of about 750°F.

Capacity of the unit is 11,600 barrels per stream day. The charge is naphtha from the crude still or mixtures of this naphtha with cracked gasoline. When naphtha is charged to the unit, it is necessary to regenerate the catalyst about once a month. Regeneration is necessary every five days when mixtures of cracked gasoline and naphtha are being treated. Two catalyst chambers have been installed so that one can be operated while the other is in the process of regeneration.

In case the catalytic desulfurization unit is shut down for any cause, a second installation is available for gasoline treating. The standby unit utilizes caustic soda for extraction of mercaptans.

The Girdler process is employed in the treatment of LPGas. This is a simple process for intimately contacting the butane and propane fractions with diethylamine, a separator to eliminate reaction products, a caustic soda wash to remove final traces of H_2S, and a regenerator.

Doctor treating is employed in finishing the kerosene for market. In this part of the treating plant, a doctor solution regenerator has been installed.

Caustic soda regeneration is effected by steam in an exhaustion tower, which has the function of extracting all the H_2S in the solutions. Before sending the regenerated solution to the treating stations, enough fresh caustic is added to bring the solutions to the desired strength.

The Salamanca steam plant consists of two boilers each with a capacity of 60,000 pounds of steam at a pressure of 275 pounds. In addition there is available 12,900 pounds of steam at 275 pounds, which is recovered from the thermal cracking unit.

The main 275-pound steam line serves the mechanical equipment, and other 10-pound lines serve the process units.

In the power plant there is a 3,000 kw turbo-generator working on steam at 275 pounds, and three 540 kw generators actuated by diesel engines. All these units generate current at 2,400 volts, three phases, 60 cycles; transformers reduce the voltage to 440 and 220.

This electrical installation is very flexible and can operate according to the amount of steam available in the refinery at a given moment. Use of the turbo-generator can be separately discontinued, and in case of steam shortage the diesel engines can take over, or the load can be distributed among the various engines according to the exigencies of operating conditions.

The water system is a closed one and supplies make-up water from deep wells on the refinery premises. The well pumps send the water to an elevated tank from which it is distributed to the water-cooling towers, to the general water supply, to the workers' quarters and to the fire protection system.

There are two water cooling towers of conventional air induction type, the smaller of which serves exclusively the 3,000 kw turbo-generator condenser. The other serves the process units and other refinery installations.

To prevent development of algae, the water is chlorinated and treated with anti-acid reagents to prevent corrosion.

Most of the gas produced in the thermal cracking unit is used in this unit for heating the light and heavy oils in their respective heaters. This fuel system operates under a pressure of 90 pounds.

There are other gas lines operating at 20 pounds which work on gas from the 90-pound line, which is used in the heaters of the desulfurizing unit and in the stabilizer. This low pressure gas may be used as fuel for the three diesel engines, which move the 540 kw generators, and under the boilers of the steam plant. For emergenies this low pressure gas system has a unit for vaporizing liquid propane.

For balancing fuel required for operation of the units, there is also a liquid fuel system. Normally this system feeds the heaters of the primary distillation unit, the boilers and the main heater of the desulfurizing unit. Naturally, for starting up the cracking unit, liquid fuel is needed for the heaters.

The refinery has a complete system of pumps for moving all classes of products in process and finished products, and also for reagent solutions as well as for water.

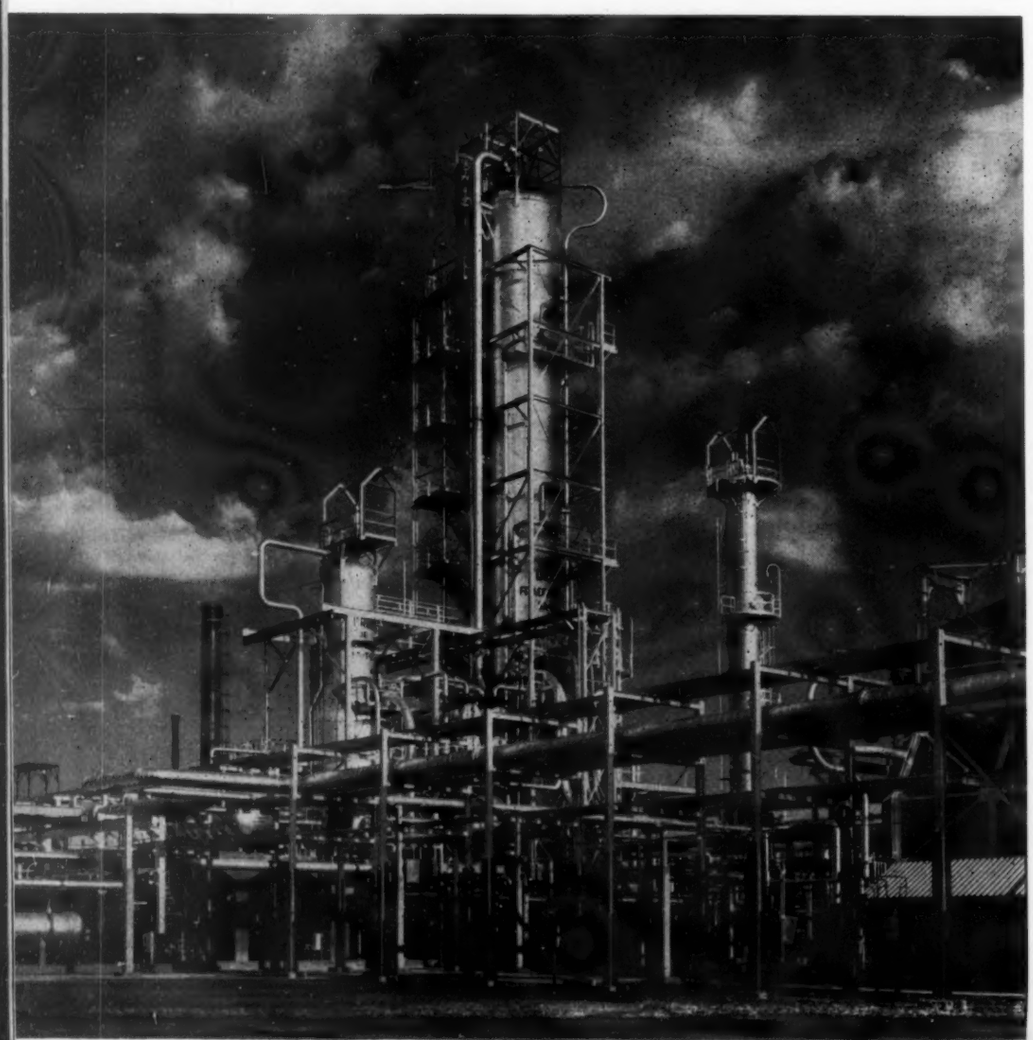
There is an ample system of loading stations for tank cars and tank trucks, with a complete network of lines for finished products.

Included in this section is a tetraethyl blending plant.

Capacity of the atmospheric storage tanks is 1,300,000 barrels, which includes tanks for oil received by pipeline, material for supplying the cracking plant, industrial fuels and for railway use and all kinds of half-refined or fully refined distillates. There is pressure storage for butane and propane.

The plant is equipped with all sorts of shops, including mechanical, internal combustion, electrical, piping, welding and carpentry. Deserving special mention is a shop for repairing tank cars which is a model of its kind and is equipped with the latest type of appliances for all kinds of repairing and painting.

The laboratories are equipped for tests on the products turned out in the refinery and can make routine physical tests. There are engines for making octane number tests; a section for Podbielniak distillations, and a section for conventional analyses.



Portion of crude distillation unit showing fractionating columns and general piping layout.

Iraq Oil Industry Moves Toward Broad Expansion

By E. Lawson Lomax

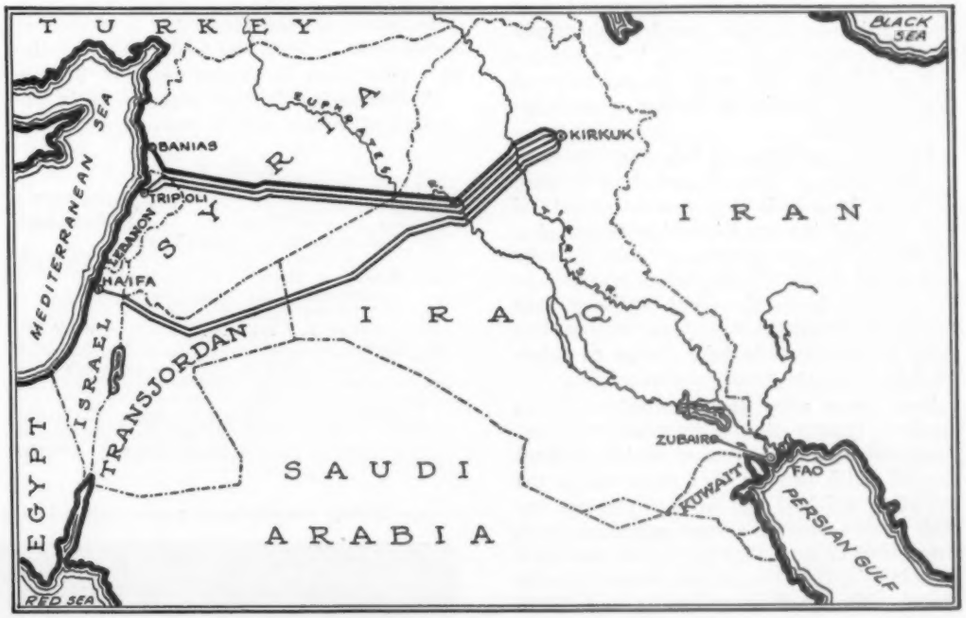
DEVELOPMENTS under way in Iraq will add greatly to the oil production of that country within the next two or three years and will give it a place of greater prominence in the international oil picture. While production began in Iraq in 1927 and led to the development of the highly prolific Kirkuk field, the location of the deposit was in the eastern part of the country, several hundred miles from deep water and with no established means of transportation.

It was not until the first Iraq pipeline was completed in 1934 that Kirkuk oil found a place on the world-market. The system consisted of a double line of 12-inch pipe from Kirkuk to Haditha, where it separated into two prongs, one continuing to Tripoli on the eastern shore of the Mediterranean, and the other bending southward through Trans Jordan and Palestine to Haifa. Capacity of the line was 80,000 barrels daily, and production, therefore, was limited to this output. At Haifa the refinery of Consolidated Refineries Ltd., subsequently erected by Anglo-Iranian and Shell, with a capacity of 80,000 barrels daily, processed the crude delivered through the southern fork of the pipeline, but in 1948 following the surrender of the British Mandate over Palestine and the troubles that arose between the government of Israel and the surrounding Arab states, the refinery was forced to close due to the refusal of the Iraqi government to permit the delivery of oil through the pipeline. As a consequence Iraq production was reduced to 24 million barrels (70,000 b/d) in 1948.

In the meantime Iraq Petroleum Company had begun the construction of a second pipeline of 16-inch diameter paralleling the route of the original system. The southern branch of the new line was constructed to the neighborhood of the Israel border, but because of the continued Iraqi interdiction against shipments to Haifa, was not carried further. The northern branch of the 16-inch line from Kirkuk to Tripoli was put into operation on May 29, 1949, and enabled production to reach 2,900,000 barrels, or 80,000 barrels daily in that year. This has been further increased by the commissioning of new pumping installations to a present average rate of 45 million barrels per year or a daily average of 123,300 barrels.

Although shut off from its normal source of crude by the refusal of Iraq to sanction the use of the pipeline and the unwillingness of Egypt to permit the passage of supplies through Suez, the Haifa refinery operated for a short time in 1949 on crude from Venezuela. Recently, through negotiations initiated by Israeli representatives, a reopening of the plant at partial capacity has been arranged. The refinery has a rated capacity of four million tons per year, but the immediate program is the processing of 750,000 tons yearly of crude from some source other than the Middle East. This is an expensive procedure for Israel, but it is undertaken in order to provide needed products for local consumption.

The existing situation is expensive also for Iraq. The reduction of four million tons in its production involves a loss in royalty of $8,400,000 (£3,000,000) which is a serious restriction of the petroleum revenues on which



Map showing route of present lines and new large diameter line on which work will begin shortly.

K-1 pump station near Haditha where the pipe line system divides into northern and southern branches.

the country is largely dependent for the financing of public works.

A new and highly important addition to Iraq's petroleum output will be provided by the third and largest of its pipelines. This line, contract for which was awarded recently to Arabian Bechtel Company (ABC) will extend from Kirkuk to Banias, a short distance north of Tripoli on the Mediterranean. Its length will be 556 miles, its diameter 30 inches, and its rated capacity 13 million barrels yearly or 260,000 barrels daily. Pipe for the line is being rolled by Consolidated Western Steel Company. Pipe for the 16-inch line, completed to Tripoli and awaiting completion to Haifa, was manufactured in the United Kingdom and on the Continent.

Stringing of the line, which will be laid from west to east, will commence with the beginning of pipe deliveries which are expected toward the end of 1950, and it is hoped that it will reach K3 station at Haditha by early 1952 and be completed to KI at Kirkuk by the end of 1952. This line, starting from Banias, will join the route of the existing 12 and 16-inch lines from Kirkuk to Tripoli at a point near the western end close to the Lebanese frontier, and from there will continue alongside to Kirkuk. The construction of this line will entail the provision of new loading facilities at Banias, where none at present exist.

Pending completion of this line, the present capacities of the 12 and 16-inch lines could be increased to a certain extent, if necessary, by the provision of more pumping stations along the route. It will thus be seen that, should circumstances warrant it, the present production with delivery only through the northern legs of the existing lines could be increased to take charge of intermediate increased requirements.

Some time after the completion of the original 12-inch line, difficulties were encountered with regard to corrosion, prevention of which had not then developed to the extent to which it had in recent years, and maintenance became a very expensive item. From 1940-47 more than 7,000 leaks had been recorded in this line, which was originally coated with asphalt enamel and wrapped with asbestos paper. In the laying of the new 16-inch line special precautions have been taken against a repetition of this, and the company has established a very efficient anti-corrosion department which was responsible for the wrapping and doping of this line as well as for cathodic anti-corrosion measures. It is expected that, with the wrapping program now utilized and the use of cathodic protection, the upkeep on the new 16-inch line and the projected 30-inch line will be much reduced. This upkeep necessitates the use of aircraft for patrolling the pipelines, and for this purpose as well as for general transport use, air stations are being extensively employed by the company.

Should the impasse which now prevents operation of the 12-inch line to Haifa, and completion of the 16-inch line destined to the same point, be resolved, the capacity of the Iraq pipeline system would be approximately as shown in Table I.

There is no doubt that the existing wells and reserves at Kirkuk are capable of meeting this production and sustaining it for years

View of Banias where the new line will deliver Kirkuk crude to Mediterranean tankers.

to come. In addition there are fields in other parts of Iraq which, when developed, will be capable of greatly augmenting this production.

Test drilling by the Basrah Petroleum Company, a member of the Iraq Petroleum Group, in 1948 revealed the existence of oil in the Cretaceous in the Zubair area a short distance southwest of Basrah, and subsequent operations have indicated that this is a field of considerable extent. Oil has been found also at a point near the Tigris north of Basrah.

A four-string drilling program is in operation at Zubair, and surveys of a pipeline route to Fao, at the head of the Persian Gulf, have been completed. Grading of the terminal site is in progress. Laying of 72 miles of 12¾-inch line is expected to start towards the end of this year, and a greater part of the construction will be carried out during 1951.

It is expected that export of oil from this point will commence about mid-1952. This will extend the activities of the Iraq Petroleum Group considerably, as it will open direct outlets for its crude oil, both to the Far East and to Australasia.

To supply the greatly increased power requirements of the expanding production of the Kirkuk field, a new power station of 70,000 kva was commissioned in August 1949. The boiler house generates 120,000 pounds of steam at 450 psi and 750°F superheat. There are 3 x 23450 kva turbo-alternators generating at 11,000 volts and running at 3,000 rpm with a small 350 kw diesel auxiliary set. Particular care has been given to the design of this station to ensure the reliability essential to a plant located far from easy access to replacement and repairs.

Table I

Diameter Inches	Section of System	Capacity Tons per Year
12	Kirkuk to Haifa (Closed since July 1948)	2,000,000
16	Kirkuk to Haifa (Construction suspended July 1948, due to disturbed conditions in Palestine)	4,000,000
12	Kirkuk to Tripoli	2,000,000
16	Kirkuk to Tripoli	4,000,000
30	Kirkuk to Tripoli (Planning)	13,000,000
Total:	Tons per year	25,000,000
	Barrels per year	190,000,000
	Barrels Daily	520,000

Newly commissioned power station in the Kirkuk field with a capacity of 70,000 kva.

The provision of social amenities for the staff, both local and imported, for a company whose operations are located in the type of country and terrain such as that of the Near East, is essential if the health and morale of employees is to be kept at a high level, and apart from this standpoint it is also a profitable investment in reducing absenteeism and replacement of highly trained imported staff. In this respect the IPC officials have shown themselves well to the fore in action and farsighted as to the mutual benefits.

In order to combat rising prices of commodities, the company has embarked on a policy of subsidizing them to the extent that these subsidies are equivalent to about $47 per year per employee, or about 15 percent on the lowest salary rate.

The question of rent and accommodation for the various grades of employees, in a country where large collections of dwellings are almost non-existent (50 percent of the population being nomadic) is of vital importance and the company has developed a large housing scheme whereby the employees are provided with suitable accommodation at rents suitable to their earnings.

Electricity and water are laid on, and water-borne sewage is provided. All roads are macadamized and have pavements and street lighting, while in some areas gardens have been laid out and trees planted. This is in spite of the fact that water for all domestic purposes as well as for processing has to be pumped at the rate of five million gallons daily from wells sunk in the alluvium of the Lesser Zab, 24 miles away.

In addition the site includes a mosque, a savings bank, post office, clinic, bazaar, shops, laundry, police quarters, clubs, restaurants, schools, sports grounds and an institute. A canteen is provided with self-contained kitchen, storehouse and its own refrigeration plant, which can serve 1,000 meals at a sitting and is open at all times for shift workers. An enlarged hospital was completed in Kirkuk in March 1950, fitted with modern appliances for the treatment of all ailments.

The company has inaugurated a scheme for training of Middle East nationals as skilled artisans, and at the present time 16 chosen trainees are undergoing courses of training in various trades in the workshops of manufacturing firms in the United Kingdom, mainly suppliers of oil and associated equipment. These courses last from one to three years, and trainees returning to Iraq will provide a nucleus around which the staff of trained craftsmen required in the oil industry will be built.

The government of Iraq has started a scheme for sending higher grade personnel for training in universities, to which the company is lending its aid and approbation.

As mentioned previously, oil royalties play a large part in the internal economy of Iraq and are the largest single source of income in the country. In 1949 payments to the Iraq government on account of royalty concession fees and tax commutation were as follows:

Iraq Petroleum Company	£2,304,000
Mosul Petroleum Company	407,500
Basrah Petroleum Company	410,500
Total	£3,122,000
	or $8,742,000

The amount of royalty paid by the Iraq Petroleum Company is a direct function of the weight of crude produced. It is equivalent to about 19 pence or just over 22 cents per barrel.

The current rate of production is 45 million barrels yearly, so in a full year the royalty on this production is about £3,780,000 ($10,584,000). When the total planned capacity of the lines is in use, the royalties at the present rates would be in the neighborhood of £15 million per year or $42 million.

[Since the above was written, a news report from Baghdad states that an agreement has been reached to raise royalties by eight to twelve percent, depending on whether they are paid in "free" gold or at the official exchange rate. This, of course, will add substantially to the government's income.]

In addition to royalty payments, made in London, total expenditure last year by the IPC group of companies was £6,566,000 or $18,485,000.

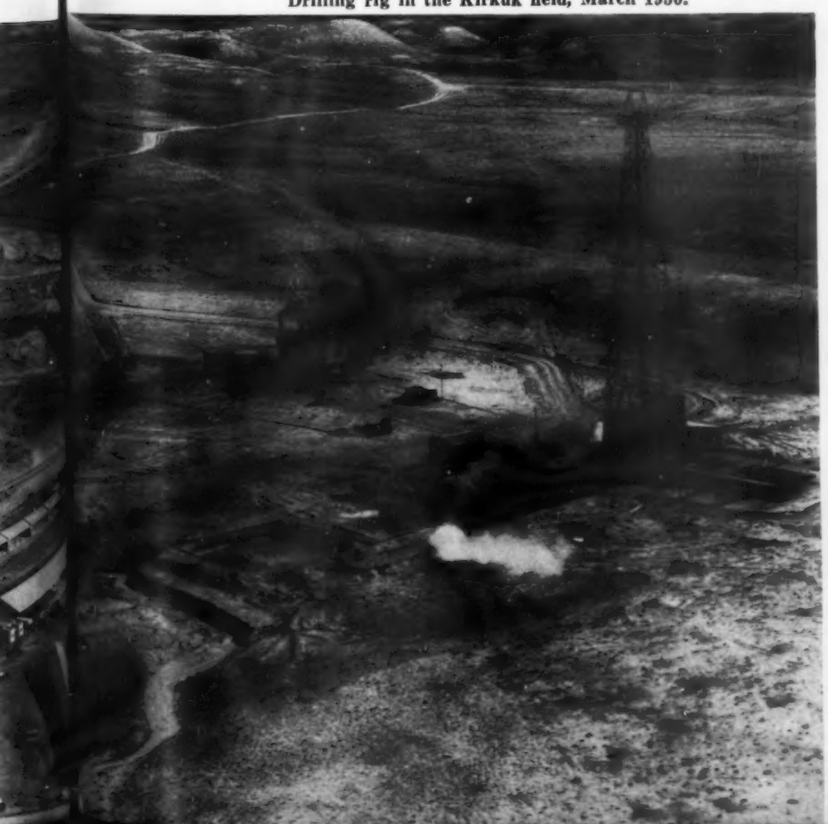
The Iraq government would like to have the present rates of royalty increased to benefit its budget, even though they are averse to doing this by allowing the delivery of oil through the pipeline to Haifa, which would automatically increase the income from that source. It is understood that talks between the parties concerned with a view to increasing the royalties have reached no definite conclusion.

Taxes and customs revenues, which provide the remainder of the country's income, are not sufficient for the funds required for the various development programs which the government has in view, mainly concerned with agriculture, to bring back what was once one of the granaries of the world to similar production again, by the provision of irrigation and flood prevention schemes, thus developing one of the great potential cereal producing countries of the world with a general uplift in the living conditions of its inhabitants.

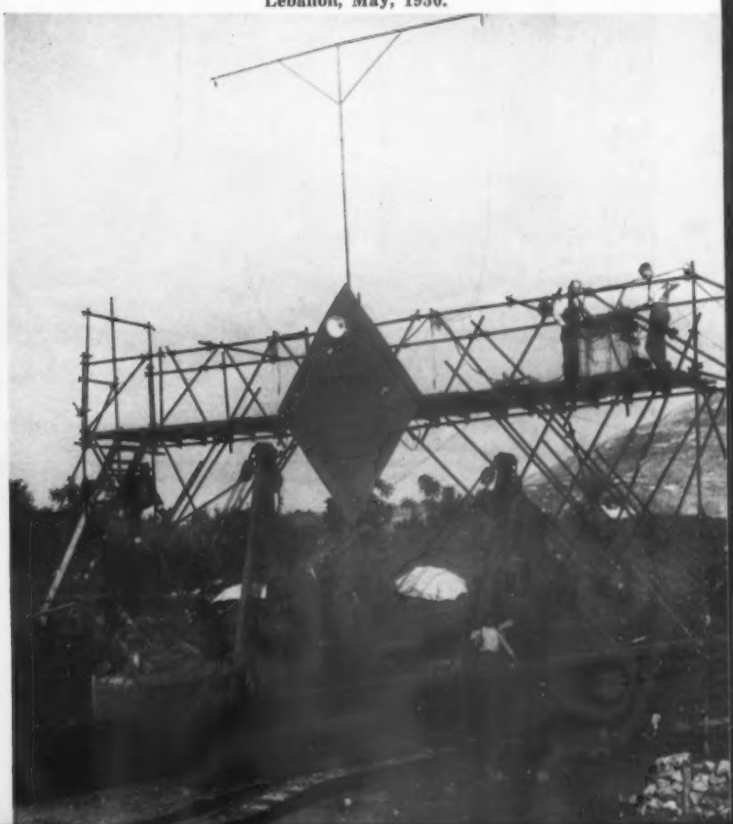
It would appear, therefore, that either an increase in oil royalties or an external loan is a necessity to this end.

Settlement of the difference between the Arab countries and Israel would place Iraq in a very enviable position among the Middle East countries, as her access to the oil markets of the European countries, which have developed their refining capacities, is more favorable than any of the other producing countries, and her production in the future should enable her to supply about one-third of their requirements.

Drilling rig in the Kirkuk field, March 1950.



Pulling the sea line to the fourth offshore loading berth at Tripoli, Lebanon, May, 1950.

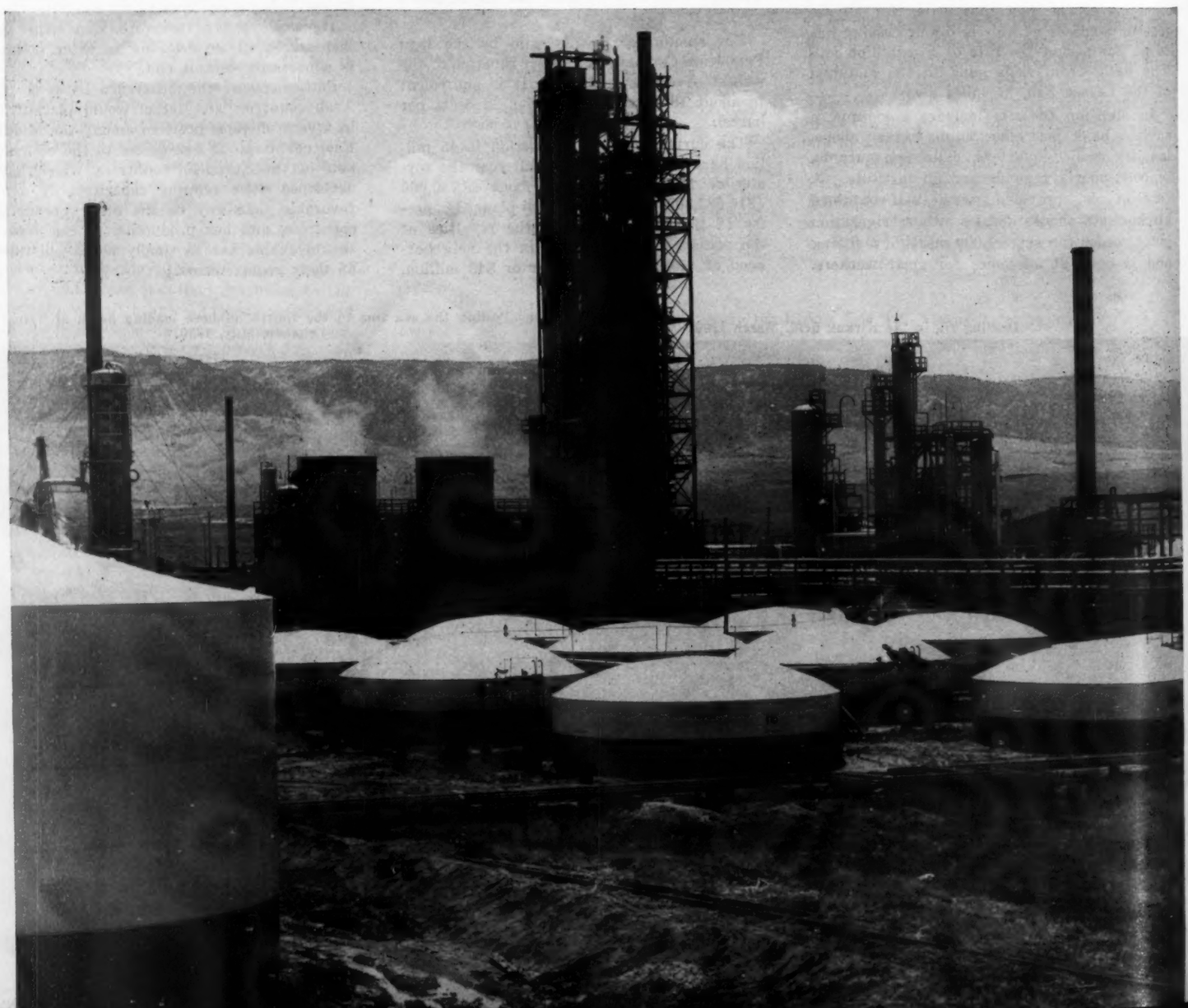


First Liquid Feed TCC Unit Completes Year of Operation at Casper

EIGHT catalytic cracking units now are nearing completion at six refineries of Socony-Vacuum Oil Co. Inc. and its subsidiary, Magnolia Petroleum Co. The eight units will have an aggregate charging capacity of 120,000 barrels daily, each being designed for 15,000 barrels of fresh feed per day. Process employed in each case is the TCC, which was developed by Socony-Vacuum to replace the earlier fixed-bed Houdry process.

First two of the new units to go on stream will be at the Magnolia plant at Beaumont, Texas, in October. A month later the Socony-Vacuum unit at Trenton, Mich., is scheduled for completion. In December units will be ready for operation at Augusta, Kan., and Buffalo, N. Y. In January 1951 the Brooklyn, N. Y., unit and a third unit at

TCC unit at the Casper, Wyoming, refinery of Socony Vacuum Oil Co., Inc., which recently completed a full year on stream.



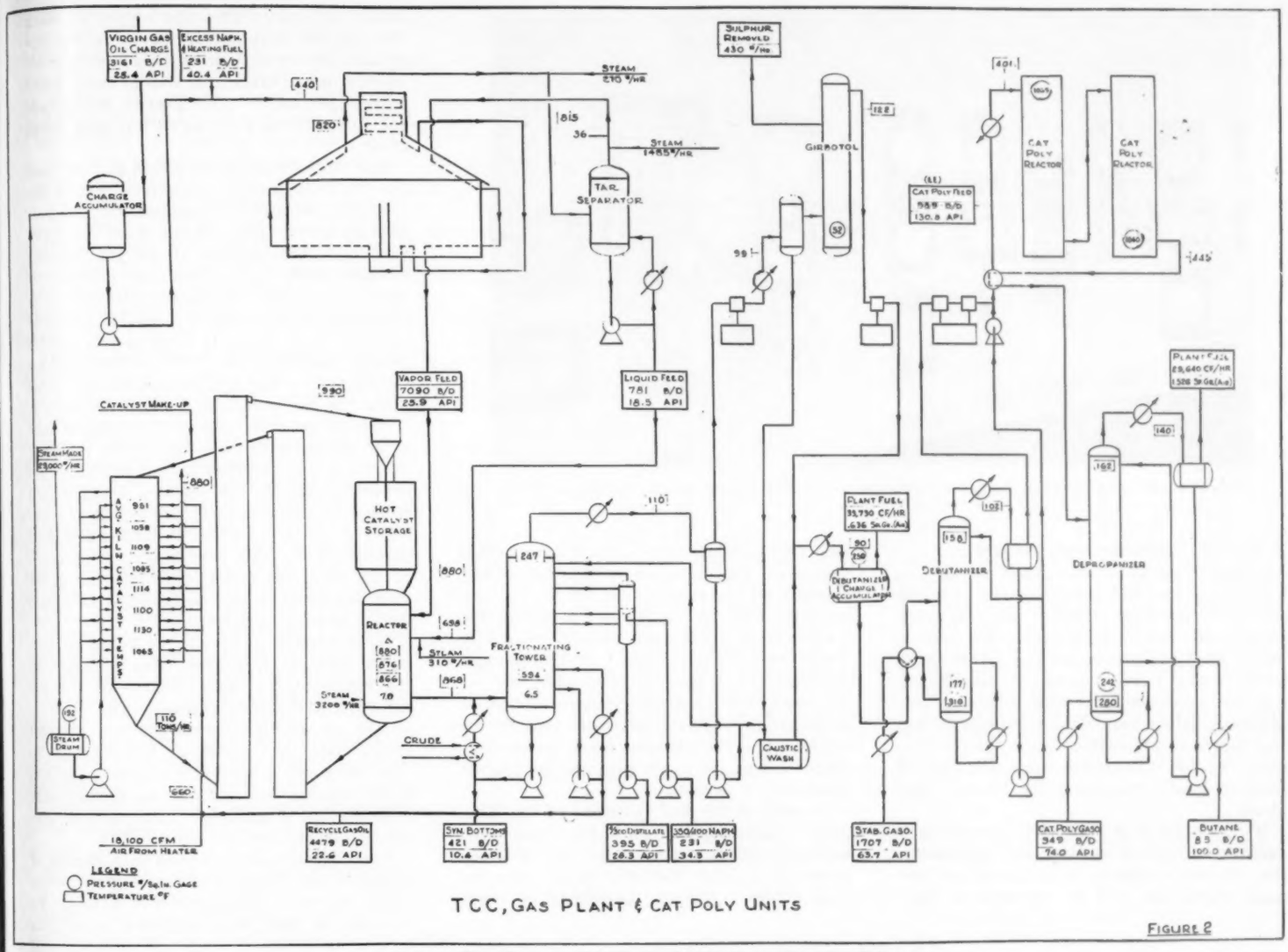


Fig. 2: Flow diagram of Casper unit showing process conditions.

Magnolia's Beaumont plant will be operating. East Chicago will follow later. In addition to the company projects, two similar TCC units licensed by Socony-Vacuum are being erected by Standard Oil Co. of Ohio at Cleveland. These will go on stream in November. Several other units of this design have been licensed by Socony.

All of the new TCC units will use an air lift system for catalyst circulation instead of the bucket conveyors employed in the first moving-bed process developed by Socony-Vacuum. The air lift has been in operation in plant-scale research work at the Paulsboro, N. J., refinery, but its first commercial application will be at Magnolia's Beaumont refinery late in September.

Use of the air lift for catalyst circulation will free the process from certain limitations which were inherent in the mechanical system. Of primary importance will be the ability to regulate catalyst oil ratios to the optimum level thereby providing much greater flexibility.

A second important process change from the earlier version will be in the feed preparation. Each of the new plants will charge a mixture of liquid and vapor, whereas the wartime TCC units and the predecessor fixed bed units were fed a completely vaporized charge.

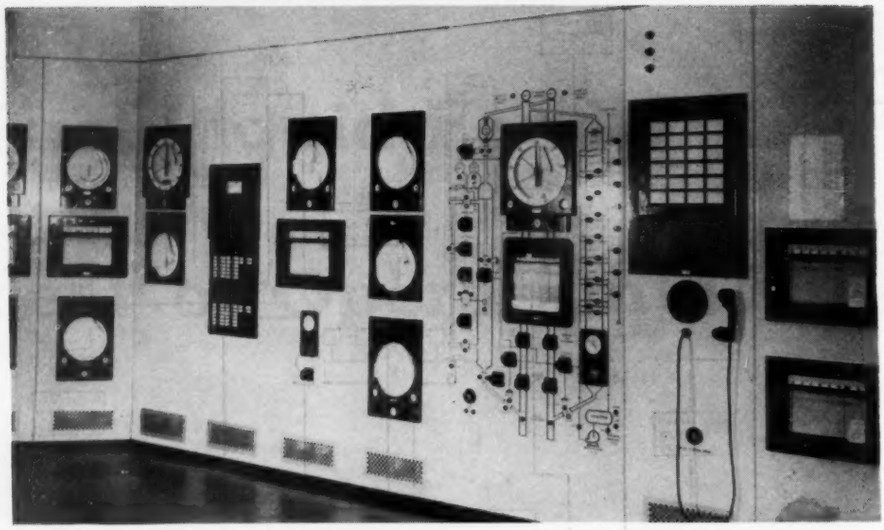
In addition to the usual research and pilot plant liquid feed runs, Socony has completed a full year of commercial operation on liquid feed at Casper, Wyo. The first year's experience was closed with a carefully conducted check run under the supervision of Emory M. Skinner, chief refinery engineer of Socony's White Eagle division.

The Casper plant has much to recommend it as a testing ground for the new type of operation because of the wide variety of crudes which must be run. Wyoming crudes supplied to the refinery range from sweet, green, waxy oils to sour black oils. Heavy gas oil from the black crude vacuum still contains more than three percent sulfur by weight and an analine number of 179.0°F, while the corresponding fraction from local sweet crudes contains about 0.38 percent sulfur and has an analine number of 219.2°F. Details of charging stock quantities and inspections are shown in Table I.

The check run at Casper extended over a period of two weeks, during which all distillation and cracking facilities were operated under uniform conditions equivalent to normal refinery operations. Only exception to this was that a supply of uniform charging stocks was accumulated for the run so that there would be no variation from day to day. All volumes were checked by meter as well as tank gages for greater accuracy. The engineering department obtained very consistent measurements throughout the system and the overall operations, and yields gave a good check with average operations over the full year that the unit has been on stream.

In its research in developing the new version of the TCC process, Socony-Vacuum worked toward the goal of charging a full range of gas oil for maximum yields of higher value products at refineries not producing lubes. A completely vaporized charge has been essential in the fixed bed units of the 1930's because of the complex vapor manifold system employed. Once the moving bed plan was adopted, it was recognized that liquid feed was possible, but development was postponed until the end of the war because of the pressure of other essential work.

Research has shown that the real problem involved was that of supplying enough heat to the reactor to get vapor phase cracking. At Casper this is accomplished partly by reheating the vaporized portion of the charge stock and partly by increasing the circulation of the hot catalyst. In subsequent units in which catalyst:oil ratios will be freed of the mechanical lift limitations, all of the heat of reaction may be supplied by catalyst,



Control room showing push button controls for by-passing reactor in case of power failure.

if that method seems more desirable.

Object of the TCC research has been to find a middle-of-the-road process condition which will give optimum results. At very high catalyst:oil ratios, researchers encountered excess fixed gas production and carbon deposition. The larger volume of catalyst increased the stripping problem and, as a consequence, utility requirements. Catalyst loss was larger in proportion to the volume handled. At low catalyst:oil ratios, the heat of reaction limits charging stock to the vapor phase.

With air lift it is possible to circulate any quantity of catalyst, so, as a practical matter, the process designers first determine how much circulation will be required to burn off carbon in one stage and at atmospheric pressure. The unit then is balanced against the kiln which, after all, is the part of any catalytic cracking unit which limits capacity.

At Casper crudes are reduced to 130 to 140°F soft point asphalt. In this manner the total gas oil ranging between furnace oil or diesel fuel and penetration asphalt is produced as a combined fresh feed to the TCC unit. The charger stock produced is 49 percent of the crude run, and the asphalt residuum 11 percent.

Because of the dual character of the Wyoming crudes handled, the plant has been equipped with two crude stills. One has been protected against corrosion and processes sour crudes. Usually the supply of sweet crudes is greater than the supply of black oils, but for purposes of the check run approximately equal volumes of each were processed, average crude still charge being 3,350 barrels per day of 28.1 gravity sour crude and 3,090 barrels daily of 35.3 gravity sweet crude.

Substantially all of the virgin gas oil from the two crude stills is transferred hot to the TCC unit, where it is combined with recycle stock in a feed drum. In the check run 3,161 barrels of 25.4 gravity virgin gas oil was available each day. This was charged at 440°F to the TCC preheater with 231 barrels daily of 40.4 gravity naphtha, bringing the total fresh charge to 3,392 barrels of 26.4 gravity cracking stock. Recycle ratio during the check run was 1.32 to one, making total charge to the preheater 7,871 barrels daily.

Effluent from the pipe still is flashed into a tar separator drum. Vapors are reheated in a portion of the preheat still to 880°F and passed directly to the reactor. Unvaporized portion of the charge is pumped to the reactor at 698°F. During the check run 23.2 percent of the raw charge and 9.9 percent of the total was liquid. Prior to the check runs somewhat higher percentages of liquid charge had been employed.

As illustrated in Fig. 1, the liquid portion of the charge is sprayed from a nozzle in the center of the upper portion of the reactor in a descending cone. The cone is within an annular curtain of hot catalyst falling into the reactor at the rate of 80 tons per hour. Liquid and vapors are mixed in the moving bed and descend concurrently with the 990°F catalyst. Total catalyst circulation is 110 tons per hour.

The Casper plant is located in a region of frequent and violent electrical storms which cause numerous interruptions of power. To take care of these interruptions a bypass has been installed which shuts off all vapor and liquid feed to the reactor until power is restored. A button in the control room is pressed by the operator which instantly causes the feed to bypass the reactor and go to the main fractionator. A record number of 19 power failures of short duration in a single shift has not caused a material disruption of TCC operations.

Effluent from the reactor is processed in a conventional distillation and vapor recovery system. Unsaturated light hydrocarbons are polymerized in a UOP cat poly unit to produce 349 barrels daily of high octane blending

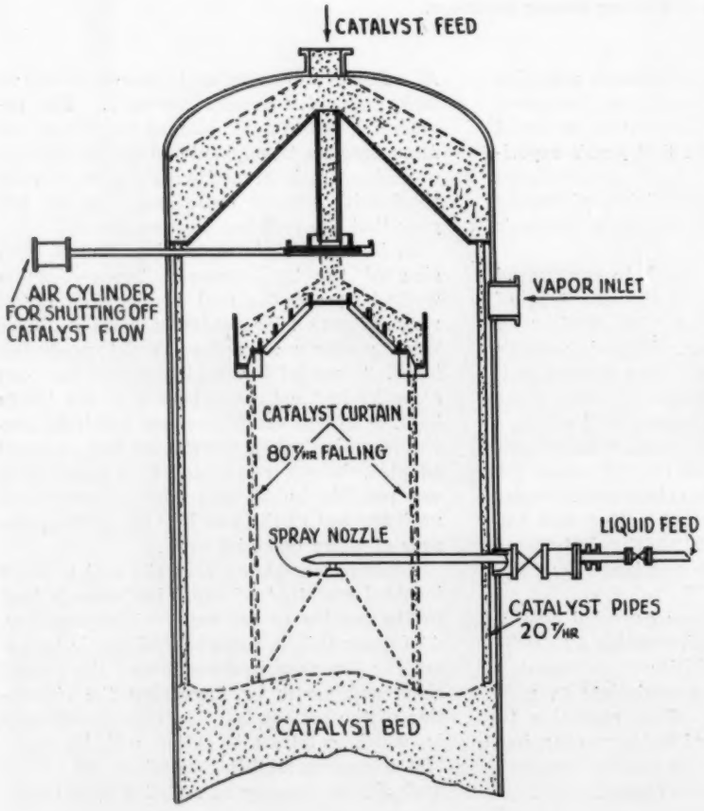


Fig. 1: Vertical section through upper part of regenerator illustrating how liquid is sprayed within a falling curtain of catalyst.

Table II

TCC Operating Conditions, June 15, 1950

Space Vel., total feed	1.62
Catalyst/oil ratio, vol. % (total charge)	2.90
Catalyst to reactor, °F	990
Avg. catalyst temperature in reactor, °F	875
Vapor feed to reactor, °F	890
Liquid feed to reactor, °F	698
Catalyst activity	29.9
Recycle ratio by volume	1.32:1
Gravity of fresh feed, °API	27.8
Vol. % liq. feed in total reactor charge	9.9
Vol. % liq. Feed based on fresh feed	23.2
Steam, Wt. % total feed	2.2
Reactor top pressure, psig	9.5
Catalyst circ., tons/hr.	110
Carbon on spent catalyst, Wt. %	1.90
Carbon on reg. catalyst, Wt. %	.47
Kiln steam prod., lb./hr. (net)	29,000
Sulfur removed in Girbotol, in form of H_2S, lb./hr.	430

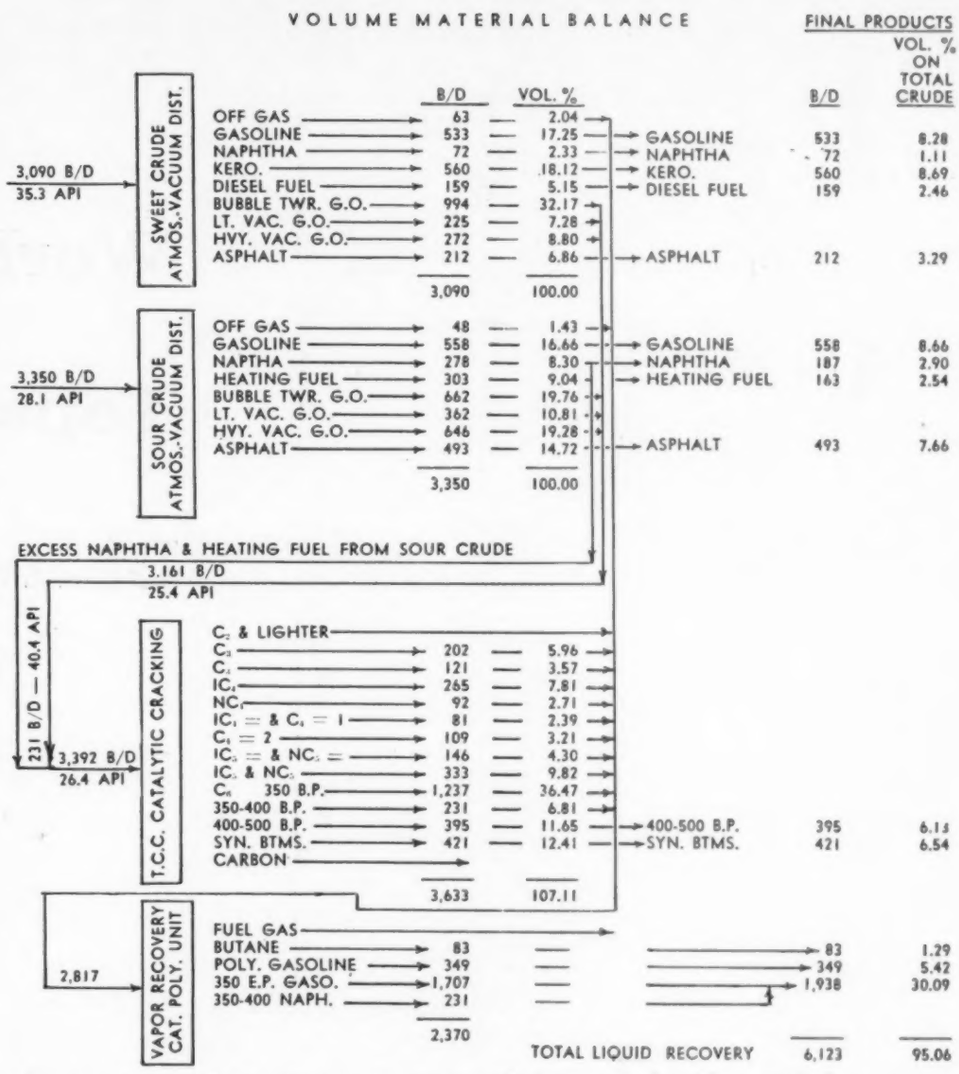
fluid. The 400 ep, 10.5-pound R.V.P. gasoline from the TCC unit tests 89.5 research octane clear and rises to 90.5 octane clear when cat poly is added. Octane number of 300 ep straight run gasoline from sweet crudes is 58.2 clear and from sour crudes is 54.1. Total of these two streams aggregating 1,091 barrels daily is blended with the 90.5 octane cracked gasoline to produce required volume of house brand and premium gasoline without the addition of TEL. As a matter of fact the current make is higher in antiknock value than competitive conditions require. The octane rating of average mountain state gasoline is lower than in any other part of the country.

The catalyst kiln at the Casper plant was built with eight burning zones, thus following earlier practice in TCC units. The kiln operates at substantially atmospheric pressure, air for burning being supplied by a 385-hp turbine driven blower. All of the new units now under construction are being built with a single zone. Catalyst oil ratio at Casper, based on total charge, has been running 2.90 to one. At new units now being built, it is calculated that a ratio in the range of about three or five to one will be employed. At this higher ratio it is anticipated that the hot catalyst will provide sufficient heat to vaporize the total charge and maintain cracking temperatures without requiring superheating the vaporized portion of the charge.

Some catalyst is being added at Casper in addition to the quantity required to make up for attrition. The quantity added is enough to maintain an activity of about 30, which is an empirical figure not yet supported by definite research.

While the unit has been protected against the corrosive effect of sour gas oils being charged, no protection against erosion by moving catalyst has been deemed necessary. Where catalyst changes its direction of flow, metal dams have been inserted to build up a bank of catalyst beads. This device causes catalyst to impinge on catalyst rather than on metal. Corrosion protection is provided by alloys in portions of the system where temperatures exceed 550°F and in the part of the fractionating column where temperatures might fall below the dew point.

General flow arrangement with process conditions are indicated in Fig. 2. Operating conditions as of June 15 were as shown in Table II.


VOLUME MATERIAL BALANCE
FINAL PRODUCTS
B/D
VOL. %
VOL. % ON TOTAL CRUDE
3,090 B/D
35.3 API
SWEET CRUDE ATMOS.-VACUUM DIST.
OFF GAS 63 2.04
GASOLINE 533 17.25 → GASOLINE 533 8.28
NAPHTHA 72 2.33 → NAPHTHA 72 1.11
KERO. 560 18.12 → KERO. 560 8.69
DIESEL FUEL 159 5.15 → DIESEL FUEL 159 2.46
BUBBLE TWR. G.O. 994 32.17
LT. VAC. G.O. 225 7.28
HVY. VAC. G.O. 272 8.80
ASPHALT 212 6.86 → ASPHALT 212 3.29
3,090 100.00
3,350 B/D
28.1 API
SOUR CRUDE ATMOS.-VACUUM DIST.
OFF GAS 48 1.43
GASOLINE 558 16.66 → GASOLINE 558 8.66
NAPTHA 278 8.30 → NAPHTHA 187 2.90
HEATING FUEL 303 9.04 → HEATING FUEL 163 2.54
BUBBLE TWR. G.O. 662 19.76
LT. VAC. G.O. 362 10.81
HVY. VAC. G.O. 646 19.28
ASPHALT 493 14.72 → ASPHALT 493 7.66
3,350 100.00
EXCESS NAPHTHA & HEATING FUEL FROM SOUR CRUDE
3,161 B/D
25.4 API
231 B/D — 40.4 API
3,392 B/D
26.4 API
T.C.C. CATALYTIC CRACKING
C2 & LIGHTER
C2 202 5.96
C3 121 3.57
IC4 265 7.81
NC4 92 2.71
IC4 = & C4 = 1 81 2.39
C5 = 2 109 3.21
IC5 = & NC5 = 146 4.30
IC5 & NC5 333 9.82
C6 350 B.P. 1,237 36.47
350-400 B.P. 231 6.81
400-500 B.P. 395 11.65 → 400-500 B.P. 395 6.15
SYN. BTMS. 421 12.41 → SYN. BTMS. 421 6.54
CARBON
3,633 107.11
2,817
VAPOR RECOVERY CAT. POLY. UNIT
FUEL GAS
BUTANE 83 → 83 1.29
POLY. GASOLINE 349 → 349 5.42
350 E.P. GASO. 1,707 → 1,938 30.09
350-400 NAPH. 231
2,370
TOTAL LIQUID RECOVERY 6,123 95.06

Details of volume material balance during the special check run made at the end of the year's run at Casper.

Table I

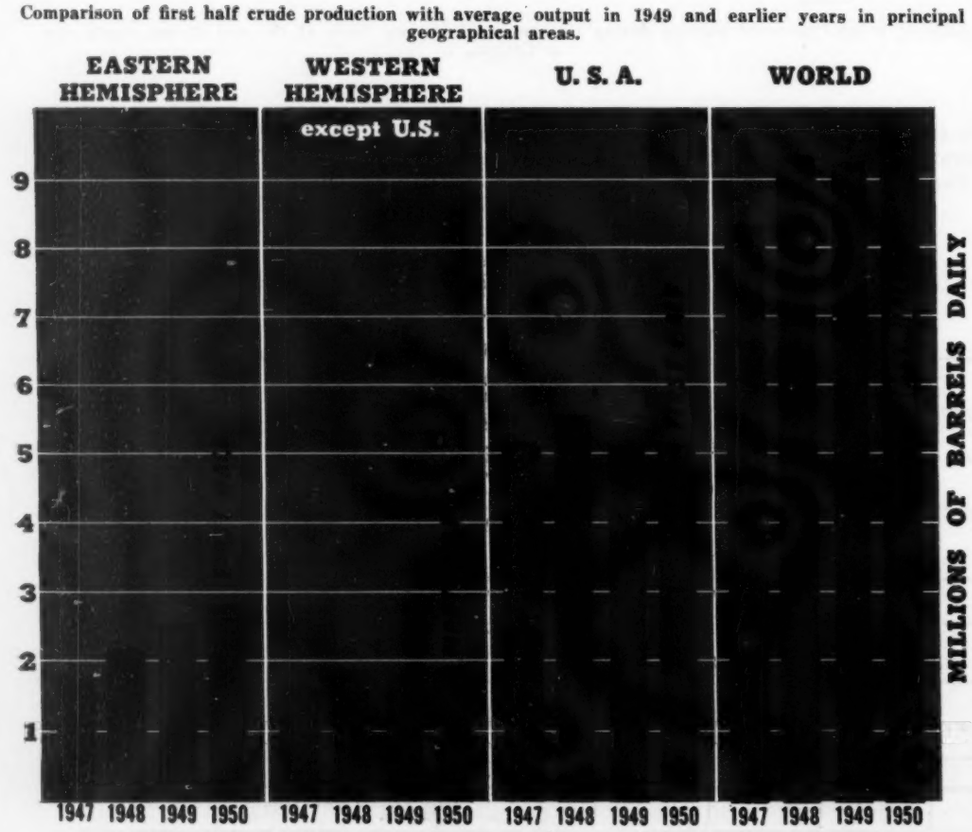
TCC Charge Stock Inspections

FLOW SHEET SYMBOL	SWEET CRUDE GAS OIL (E)	(L)	(H)	SOUR CRUDE GAS OIL (M)	(S)	(P)	TCC CHARGE (T)	(HH)	(FF)	(GG)	(V)
PRODUCT	Sweet Crude Bubble Tower Gas Oil	Green Crude Vacuum Tower Light Gas Oil	Green-Crude Vacuum Tower Heavy Gas Oil	Sour Crude 500/750 G. O.	Black Crude Vacuum Tower Light Gas Oil	Black Crude Vacuum Tower Heavy Gas Oil	Total Charge Including Recycle	Excess Naphtha Charge	Tar Seperator Overhead	Tar Separator Bottoms	TCC Recycle Gas Oil
QUANTITY B/D	994	225	272	662	362	646	7875	231	7094	781	4479
API	30.2	23.4	21.1	30.8	20.8	18.5	24.9	40.4	25.9	18.5	22.6
Type Distillation (% Rec.)	Vacuum Engler	Vacuum Engler	Vacuum Engler	Vacuum Engler	Vacuum Engler	Vacuum Engler	Vacuum Engler	ASTM	Vacuum Engler	Vacuum Engler	Vacuum Engler
IBP	520	480	660	387	525	465	460	310	425	440	414
10	605	780	896	516	715	781	500	365	490	605	509
20	650	815	928	547	746	813	525	384	522	690	525
30	683	835	952	573	772	831	551	398	539	765	538
40	712	837**	969	602	793	852	580	412	565	827	550
50	743		980	627	815	880	611	426	588	871**	565
60	765			655	837	910	648	440	614		595
70	792			683	862		690	456	646		626
80	822			714	892		739	474	692		660
90	856			750	926		819	504	775		692
E.P.								590			
% Rec.											
Aniline No., °F	192.9	204.1	219.2	155.3	161.2	179.0	143.2		148.6	178.5	112.5
Pour Point, °F											
Sulfur Weight %	.15	.33	.38	1.77	2.96	3.14	1.23	.21	1.2	1.61	1.27
Flash Open Cup, °F	270										
Conradson Carbon							.29		.05	2.94	

NOTE: Vacuum Engler Data Corrected to 760 MM.
** Cracking.

World Production Tops Ten Million Barrels Daily

Comparison of first half crude production with average output in 1949 and earlier years in principal geographical areas.



WORLD production of crude petroleum exceeded ten million barrels daily in June for the first time in the history of the industry. Average for the month was 10,406,700 barrels daily, compared with 9,833,700 in May, 9,520,400 in the first quarter and an average of 9,331,700 in 1949. First half production was 4.5 percent greater than 1949, and current output is running 10 percent above last year.

Indications today are that production will continue to climb during the last half of the year and may pass 10.5 million barrels daily before 1951. Even before the rearmament program got under way and before the increase in military consumption of products in the Korean theatre of operations, the demand for petroleum had risen so sharply in the first half of the year that production was responding in the principal oil countries of the world.

An important factor affecting the rate of production in the last half of 1950 is the volume of oil necessary to fill some of the new pipelines which soon are to be placed in operation. The Trans Arabian Pipe Line will require about 5,300,000 barrels of oil from Saudi Arabian fields before the first barrel can be pumped from the western end of the Tapline to start loading tankers at Sidon. First loading is scheduled for Jan. 1, 1951, so Arabian Oil Co. will have to produce nearly 30,000 barrels daily more oil than it sells in the last half-year. A similar situation exists in Canada where two million barrels of oil will be required to fill the Interprovincial line. Part of this oil will not be required until next year, but a considerable section is being put into operation in 1950.

Domestic crude production in the United States increased 230,000 barrels on a daily

average basis in the second quarter to 5,151,000. June production is estimated at 5,343,000 barrels daily, compared with 4,968,000 in April, an increase in the two months of 375,000. The expansion of output has continued since midyear, being accelerated by the military emergency.

Second greatest increase in production was in the Middle East. June production in this area averaged 1,845,000 barrels daily, an increase of roundly 250,000 barrels over the first quarter.

Latin American production showed an increase of only 40,000 barrels daily in the second quarter. The small size of this increase was due primarily to the Venezuelan strike in May, which prevented the production of a minimum of six million barrels of oil and possibly as much as nine million. June production of the area was 290,000 barrels daily higher than the first-quarter average.

Aside from the USSR, European production continues to show little change. In the oil fields of Oceania and the Far East current production is running about 10 percent above last year, although a number of potentially rich fields still have not been put back on production since the close of the war. Political conditions in Indonesia are becoming more settled, however, suggesting that northern Sumatra and Java fields may be back in the producing column by next year.

In Netherlands Borneo political conditions have been far more stable since the war than in other parts of Indonesia. Shell produced 5,855,000 barrels in five fields there in 1948 and 6,118,050 barrels in 1949. Seven wells were drilled with a total footage of 34,484 during the year, and four rigs were running on Dec. 31. There were 654 producing wells in the four active Borneo fields.

In British Borneo the sharp upward trend of production is continuing as it has throughout the postwar period. In 1949 production averaged 70,500 barrels daily as compared with 54,000 barrels in 1948 and 35,600 in 1947. In the first quarter of this year production passed 75,000 barrels daily and still is rising. Most of the production is that of British Malayan Petroleum Co. Ltd. (Shell) in the Seria field of Brunei. In 1949 the company drilled 15 wells, of which 14 were oil producers and one a gas well. Four drilling rigs are running. Total footage drilled last year was 102,124. Total number of producing wells at the year-end was 150. The Miri field in Sarawak, which was discovered by Sarawak Oilfields Ltd. in 1911, is still producing 1,180 barrels of crude daily from 103 wells.

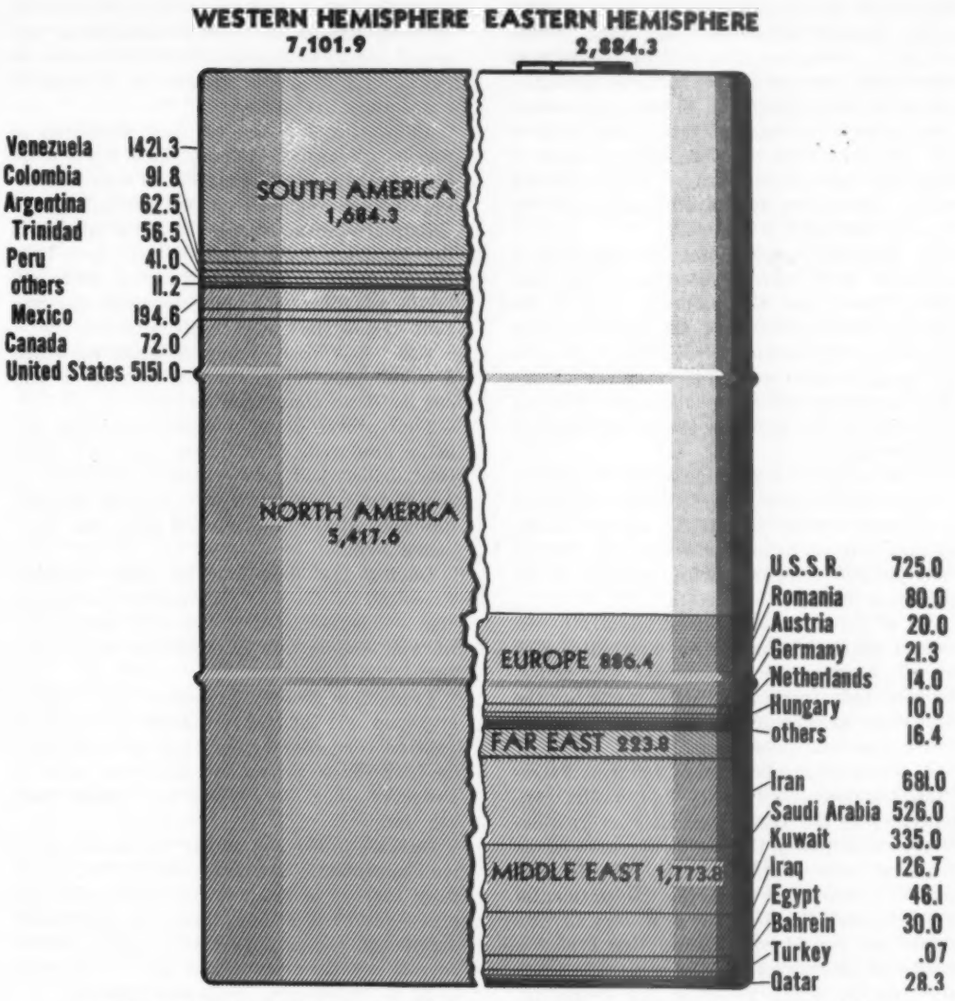
Wildcatting is continuing in New Guinea in addition to some development work in the Klamono field which was brought into production at the beginning of 1949. Four wells classed as wildcats were drilling at the end of 1949.

In Java Shell interests still have not regained control of properties in the Rembang fields because of political conditions. In the Sourabaya district the Kroeka field produced 1,430 barrels daily in 1949 from 61 wells. Two gas wells were completed during the year and one well was shut down at the end of the year because of political conditions.

Shell had much better success in getting its properties back into production in south Sumatra last year. Total production from 10 fields was 14,020,940 barrels in 1949 compared with 9,717,700 from five fields the previous year. Three of the most notable fields to return to production are in the Djambi area. The Kenali Asam field produced 2,363,500 barrels from 42 wells in 1942 and was producing 7,250 barrels daily at the end of the year. No oil was produced from this field in 1948. The Tempino field produced 2,229,900 barrels in 1949 as against nothing in 1948, and was yielding 7,500 barrels daily at the end of the year from 41 wells. Badjoebang in the same area, which originally was discovered in 1927 and produced nearly 25 million barrels before the war, was back in 1949 with 656,600 barrels of crude from 19 wells. At the end of the year 18 wells still were shut in. Output at the year-end was averaging 3,270 barrels daily.

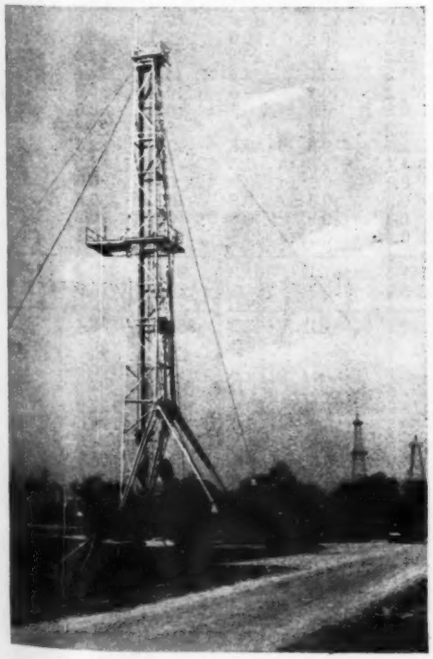
Examination of second-quarter production figures for the Middle East reveals the extent to which currency considerations have affected the relative output of various nations. Sterling nations such as Iran, Kuwait and Iraq have shown far greater increases than Saudi Arabia, which has ample ability to expand its output as greatly as other areas. Iran has shown an increase of 22 percent in output in the second quarter as compared with 1949, Kuwait production in the second quarter was 39 percent higher than in 1949, and Iraq was up 48 percent. These compare with an increase of 10 percent in Saudi Arabia. It should be mentioned, of course, that Iraq production rose as fast as it did because of greater pipeline outlet.

Middle East production in the second quarter was 18.3 percent of the world's total output. This compares with 16.8 percent in the



Analysis of eastern and western hemisphere production in the second quarter of 1950.

Cantilever type rig currently being used in drilling in the Schoonbeek field in the Netherlands which is currently one of the most prolific producing areas in western Europe.



first three months and 15.4 percent in 1949.

In Kuwait production has been rising steadily during the first half of the year as additional market outlets became available. Average daily production in the first quarter was 289,000 barrels compared with 242,000 for the year 1949. In the second quarter of this year production averaged 335,000 barrels daily, rising from 305,000 in April to 342,000 in May and 358,000 in June.

A moderate drilling program has been in progress in the first half with two rigs running. There were 87 producing wells in the Burgan field on Dec. 31, 1949, and 96 on June 30, 1950. The Kuwait Oil Co. Ltd. has made no announcement regarding progress of the deep test being drilled to determine what possibilities, if any, lie below the present producing horizon.

With additional pipeline outlet available, the production from Iraq fields was increased to a daily average of 126,700 barrels in the second quarter. In May and June the average was 133,000 compared with 112,700 in the first quarter.

Qatar output was increased slightly in the second quarter as more ships arrived to pick up oil. Average for the quarter was 28,300 barrels daily, compared with 27,000 in the first three months after the field was brought into commercial production.

A recent arbitration award confirms Petroleum Development (Qatar) Ltd. in its contention that the 1935 concession covers tidelands surrounding the peninsula as well as the land mass itself. Superior Oil Co. will thus be restricted to exploring the continental shelf beyond the territorial waters of the shiekdom. Considerable negotiation probably must still be carried on before precise limits are fixed in which Superior and Petroleum Development may drill.

As the end of 1949 there were 110 oil wells in Saudi Arabia, of which 81 were being produced and 29 were available for production as market requirements dictate or as pipeline connections are made.

In Abqaiq 60 wells had been drilled up to the end of 1949. Of these three were being operated as observation wells, 45 were producing and 12 completed but not producing.

Second most active field in Saudi Arabia is the Dammam dome where 39 wells have been drilled. Of these 31 were producing at the end of the year, one was being repaired, one was shut in and six had been abandoned.

Qatif had nine completed wells, of which five were producing, three were shut in and one had been abandoned.

Four proven fields in Saudi Arabia are not being produced. In Ain Dar nine wells have been drilled and made ready to produce; in Ain Haradh three wells are complete. Al Fadhili and Abu Hadriya each have one completed well.

During the first half of 1950 Arabian American Oil Co. was operating three drilling rigs which completed 11 wells. Of these seven were in Abqaiq, two in Qatif and two in Ain Dar.

Production from the three active fields averaged 451,200 barrels daily in the first quarter, compared with an average of 477,000 in 1949. Peak production last year was in February when the average was 532,000 barrels daily.

Increase in demand during the second quarter has brought the average up 75,000 barrels daily average to 526,000. June production set a new record of 562,600 daily. As mentioned previously, the company will require 30,000 barrels per day over the last half of the year to fill the 1,100-mile, 30-31-inch Tapline.

Production in Egypt averaged 44,950 barrels daily in the first half of 1950 compared with 43,500 in the year 1949 and 36,900 in 1948. The increased production last year came from the new Sudar and Asl fields on the Sinai peninsula, jointly owned by Shell and Socony-Vacuum. At the end of 1949 six wells in Sudr were producing 15,457 barrels daily, and five wells in Asl were producing 6,012 barrels. In the first half of 1950 Sudr output dropped slightly to 14,700 barrels daily. Standard Oil Co. of Egypt found oil at Wady el Feiran in 1949 but has not developed the field because of the present attitude of the government on controls and concession terms. The government itself now is beginning a program of exploration through the National Petroleum Co. of Egypt.

While most of the Soviet-dominated countries have achieved substantial increases in crude production, the opposite is true in Hungary. For this year the three-year plan of 1947 had set a goal of 14,000 barrels of crude per day. Actually current production is about 10,000 barrels daily. The new five-year plan recently published is silent about what oil production should be at the end of the term. Apparently the government is not too sanguine.

Romania also has been unsuccessful in developing its oil fields as a state enterprise under Soviet domination. Production of previously known fields has slipped slightly, in spite of an active drilling campaign. Wildcatting has brought in no new supplies of consequence.

In Poland as in other Soviet-controlled areas, it is necessary to estimate production on the basis of "plan fulfilment" announcements. These generally are in terms of percentages so it is not possible to be precise in stating production in terms of physical volume. Based on public announcements, it is

WORLD CRUDE OIL PRODUCTION

Thousands of Barrels Daily

Country	Year 1949	1st Q. 1950	April 1950	May 1950	June 1950	2nd Q. 1950
North America						
United States	5,042.0	4,921.0	4,968.0	5,143.0	5,343.0	5,151.0
Canada	57.5	70.5	68.4	72.5	75.0	72.0
Mexico	167.0	186.8	188.8	194.2	191.7	191.6
Total North America	5,266.5	5,178.3	5,225.2	5,409.7	5,615.7	5,417.6
South America & Caribbean						
Venezuela	1,321.4	1,390.0	1,441.0	1,253.0	1,570.0	1,421.3
Colombia	81.5	82.9	94.0	92.0	89.3	91.8
Argentina	63.5	62.5	62.5	62.5	62.5	62.5
Trinidad	56.5	56.5	56.5	56.5	56.5	56.5
Peru	40.5	41.0	41.0	41.0	41.0	41.0
Ecuador	7.2	7.2	7.2	7.2	7.2	7.2
Bolivia	1.9	1.7	1.7	1.6	1.5	1.6
Cuba	0.3	0.4	0.4	0.4	0.4	0.4
Brazil	0.3	0.8	0.8	0.8	0.8	0.8
Chile	0.4	1.2	1.2	1.2	1.2	1.2
Total So. America	1,573.5	1,644.2	1,706.3	1,516.2	1,830.4	1,684.3
Total West. Hemisphere	6,840.0	6,822.5	6,931.5	6,925.9	7,446.1	7,101.9
Near and Middle East						
Iran	561.0	645.4	688.0	670.0	685.0	681.0
Saudi Arabia	477.0	451.2	465.6	550.9	562.6	526.0
Kuwait	242.0	289.0	305.0	342.0	358.0	335.0
Iraq	85.0	112.7	114.0	133.0	133.0	126.7
Egypt	43.5	43.8	44.7	47.6	46.1	46.1
Bahrein	30.0	30.0	30.8	29.2	30.0	30.0
Turkey	0.3	0.7	0.7	0.7	0.7	0.7
Qatar	—	27.0	31.0	24.0	30.0	28.3
Total Near & Mid. East	1,438.8	1,599.8	1,679.8	1,797.4	1,845.4	1,773.8

Country	Year 1949	1st Q. 1950	April 1950	May 1950	June 1950	2nd Q. 1950
Europe						
Romania	85.0	82.0	80.0	80.0	80.0	80.0
Austria	18.0	20.0	20.0	20.0	20.0	20.0
Germany	16.3	18.9	20.8	21.2	22.0	21.3
Netherlands	11.8	13.6	14.0	14.0	14.0	14.0
Hungary	10.3	10.2	10.0	10.0	10.0	10.0
Yugoslavia	6.5	6.5	6.5	6.5	6.5	6.5
Poland	3.3	3.4	3.4	3.4	3.4	3.4
Albania	2.5	2.5	2.5	2.5	2.5	2.5
France	1.1	1.3	1.3	1.3	1.3	1.3
United Kingdom	0.9	0.9	0.9	0.9	0.9	0.9
Czechoslovakia	0.8	0.8	0.8	0.8	0.8	0.8
French Morocco	0.4	0.8	0.8	0.8	0.8	0.8
Italy	0.2	0.2	0.2	0.2	0.2	0.2
Europe Ex USSR	157.1	161.1	161.2	161.6	162.4	161.7
USSR*	690.0	720.0	724.0	725.0	726.0	725.0
Total Europe	847.1	881.1	885.2	886.6	888.4	886.7
*Includes Sakhalin, 19,000 B/D						
Far East & Oceania						
Indonesia	115.9	120.0	123.0	125.0	127.0	125.0
British Borneo	70.5	76.2	77.0	78.0	79.0	78.0
New Guinea	4.8	4.8	4.8	4.8	4.8	4.8
India	5.3	5.5	5.5	5.5	5.5	5.5
Japan	3.7	5.0	5.0	5.0	5.0	5.0
China	2.0	2.0	2.0	2.0	2.0	2.0
Pakistan	2.6	2.5	2.5	2.5	2.5	2.5
Burma	1.0	1.0	1.0	1.0	1.0	1.0
Total Far East	205.8	217.0	220.8	223.8	226.8	223.8
Total East. Hemisphere	2,491.7	2,697.9	2,785.8	2,907.8	2,960.6	2,884.8
WORLD TOTAL	9,331.7	9,520.4	9,717.3	9,833.7	10,406.7	9,986.2

estimated that Poland is producing about 3,400 barrels of crude oil per day this year compared with 3,300 in 1949 and 3,100 in 1948. Figures for 1947 seem authentic at 2,600 barrels. In addition to its crude oil, Poland produces some 700,000 barrels yearly of synthetic oils from coal hydrogenation plants.

The government enterprise, Exploration Drilling Co., is wildcatting in the Carpathians in addition to drilling development wells. Drilling program is about 200,000 feet per year equally divided between exploration and development.

Official announcements of the USSR oil authorities continue to indicate a substantial rate of rise in Russian production. In Sakhalin island production remains about steady at around 19,000 barrels daily. In Russia proper output now is well above the current five-year plan which ends in 1950. The target of this plan was reached in 1949, and production now is running above 700,000 barrels daily in continental fields. Some authorities now believe the total for the nation to be around 800,000.

An active search for oil in western Germany is being rewarded by increasing supplies. A recent discovery in south Oldenburg is intermediate between Hanover and Emsland fields and has given rise to seculation regarding connections between the two areas. Emsland field production averaged 10,000 barrels per day in May compared with 9,400 in April. Western Germany as a whole was up to 22,000 barrels daily in June compared with 16,300 for the year 1949.

Three companies now are drilling an offshore well in the North Sea near the mouth of the Elbe River. Discovery of oil in anticlines and stratigraphic traps has given fresh impetus to drilling, because most oil previously had come from salt domes. The year's drilling program for western Germany has been set at 1,500,000 feet, and current records indicate that this target may be reached. National reserves are now estimated at 260 million barrels, up 150 percent over 1948.

Three wells now have been completed in the new Lacq field in the lower Pyrenees region of France. Combined producing capacity of the three wells is reported to be about 1,500 barrels daily, if operated at capacity.

Development drilling in the Schoonbeek field in The Netherlands now is largely complete, and production is tending to level off. In 1949 Royal Dutch-Shell and Standard of New Jersey drilled 18 oil and two service wells to bring the total number of oil wells in the field to 94. Production averaged 11,800 barrels daily. This now has risen to around 14,000 barrels.

In Latin America there were no notable changes in production, outside of the two largest producing nations, Venezuela and Colombia. Argentina, Peru and Trinidad are marking time.

Second quarter crude production in Colombia was up an average of about 10,000 barrels daily to 91,800. First quarter production averaged 82,900 compared with 81,500 barrels daily last year. Principal increase was in the Yondo concession of Compania Colombiana de Petroleo el Condor (Shell), where production now is about 28,000 barrels daily compared with less than 16,000 earlier this year. Half of 1949 development drilling in Colombia was on this concession.

Concession activity has died down in Colombia in the past year or so as wildcatting results have been generally negative. Last year 14 wildcats yielded one good discovery by Texas Petroleum Co. in the Upper Magdelena valley at Tetuan. In the previous year 18 wildcats brought in one gasser and no oil wells. Six new concession applications were filed in 1949 compared with 32 in 1948 and 39 in 1947.

Final organization of the Colombian company to take over the DeMares concession in 1951 has not yet been completed. Tropical Oil Co. has notified the government that it does not wish to participate in the new company but does wish to continue in business elsewhere in Colombia. Plans are being studied by the government to increase refining and pipeline facilities.

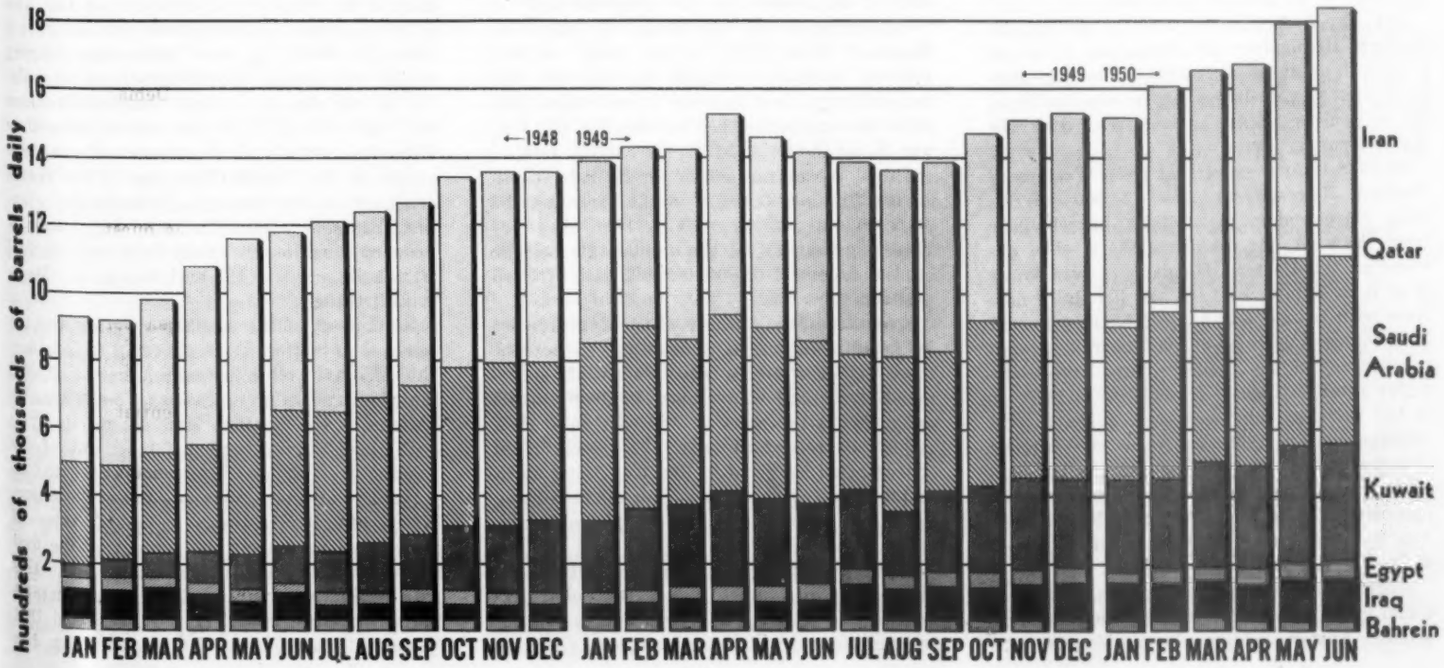
Except for May when field activities were halted by a strike, production has tended to rise steadily in Venezuela during recent months as market opportunities have reopened. After the close of the heavy fuel oil season in January, production dropped to 1,320,000 barrels per day in February, but by April was back again above 1,400,000. The May strikes cut output to an average of 1,253,000 barrels, but in June the shortage was made up by a record 1,570,000 barrels, bringing the average for the quarter to 1,421,300 compared with 1,390,000 in the first quarter. June production was 15.3 percent of the world's total, compared with 14.2 percent in 1949.

With the future market outlook more encouraging, exploratory activities have been stepped up in Venezuela. July activity was 45 percent higher than a year ago. At the close of the first half of the year 21 wildcats were being drilled, some at great depths. Creole had one test well drilling below 17,000. Several Cretaceous tests were made in the 14,000-foot range.

In Mexico drilling continues to bring in new production at a satisfactory rate, although most of the increase is being obtained by exploitation of Poza Rica. Only four exploratory wells were drilled in the first half as compared with 80 development wells. First quarter production of crude was 16,709,789 barrels and distillate 8,756 barrels. In the second quarter crude output was 17,905,101 barrels and distillate 7,592 barrels. News of Mexican-American Independent drilling operations in Vera Cruz and Campeche is lacking.

Whatever may be the outcome of the present fighting in Korea, it is apparent that an international race is in prospect. This will require the petroleum industry to expand its worldwide operations and to produce greatly increased quantities of oil.

Middle East crude production has resumed its upward trend following the midyear dip in output in 1949.



World Oil Consumption Increases Seven Percent In First Half

WORLD consumption of petroleum products was running about seven percent ahead of last year in the first half of 1950 and may rise as high as nine or ten percent above 1949 before the year is over.

North American oil consumption was 12 percent above last year in the first six months, and South American demand was rising at an even higher rate with several of the most important consuming nations reporting warm weather sales in the early months of the year at 16 to 35 percent above 1949.

The demand pattern in the Eastern Hemisphere is much more spotty than in the west because of disturbed political conditions. China and Korea have almost disappeared as consumers of petroleum in the normal channels of trade. The current military consumption in Korea will more than overbalance normal usage, but this will appear in the figures as United States consumption. Contrasted with eastern Asia demand, however, it is to be noted that removal of restrictions in Australia, New Zealand and India is affecting demand to the point where the Far East and Oceania as a whole may show an increase of perhaps five percent.

West of Suez oil demand is rising much faster than east of Suez. European consumption during the first half year was only a little behind the Western Hemisphere in rate of increase. With gasoline restrictions lifted in the United Kingdom, the rate of increase there is stepping up in line with other western European nations which have been showing increases of 10 percent and above.

For the first time in modern history the Eastern Hemisphere is producing about as much oil as it is consuming. The net flow from west to east in recent months has dried up to a mere trickle as compared with the flood of earlier years.

In 1938 the net movement from Western to Eastern Hemispheres was 724,000 barrels daily. Europe alone took 545,000 barrels daily from the west. At that time the level of demand in the Eastern Hemisphere was lower than it is today. In 1948 the net daily flow from west to east was 513,000 barrels, and in 1949 this was down to 388,000 barrels. A map reproduced on the opposite page traces the major intercontinental flow of oil in 1949. It is too early to construct such a chart with confidence for 1950 in view of current changes, but it may be said that the net flow from west to east will be of inconsequential proportions, with Eastern Hemisphere output now in the vicinity of three million barrels daily.

Northbound oil traffic through the Suez Canal gives a good insight into the growth of Middle Eastern shipments to Europe and North America. In 1949 the average was 745,000 barrels of crude and products per day, an increase of 29 percent over the 570,000-barrel movement in 1948 and of 170 percent over 1947 canal traffic. This year the canal is handling about as many ships as can be crowded through it conveniently, but by 1951 tanker movement will drop when Tapline is opened with an initial capacity of about 350,000 barrels per day.

At the beginning of 1949 it was estimated by most students of the industry that United States domestic demand would rise about five percent in 1950. Recent estimates by the U. S. Bureau of Mines and by the Independent Petroleum Association are that the full year will show an increase of 7.2 percent in domestic demand in the United States. In North America outside the United States, it was thought that a similar rate of increase, about five percent, would prevail, while in South America the anticipated increase was on the order of 10 percent.

First half year domestic consumption in the United States rose a surprising 12 percent to 6,300,000 barrels daily. In other parts of the Western Hemisphere statistics of demand do not become available as early as in the United States, but fragmentary reports indicate very large increases in Canada and in Latin America. Canadian oil demand in the first two months of 1950 averaged 256,000 barrels daily compared with 222,000 barrels in the same period last year. The percentage increase was 15.25. This compares with an increase in 1949 of 10 percent over the previous year.

Consumption of petroleum products in Venezuela rose 5,750 barrels daily or 34.3 percent in 1949 to 22,530 barrels, and this astonishing rate of increase in continuing this year. Estimates are that average for the year will be on the order of 40,000 barrels daily.

Brazil is not far behind in its rate of increase. Summer demand in the early months of 1950 was running 20 percent ahead of 1949, suggesting that the annual rate may be on the order of 68,000 barrels daily for all products.

Argentina, the largest user of petroleum in Latin America, is consuming 16 percent more oil than a year ago. To satisfy a demand averaging more than 170,000 barrels daily, Argentina must now import more than 100,000 barrels of oil daily. The growth of oil consumption here and in Brazil is doing much to take care of the Venezuelan oil previously moving to Europe but now supplemented by Middle East crude.

Although Colombia in common with many other countries must watch its dollar expenses, the country has been increasing its consumption of petroleum products. Gasoline consumption in six cities in 1949 increased 13.2 percent last year. Total national consumption of petroleum was seven million barrels, up 13 percent. The nation used 23.5 percent of its own oil production and exported 76.5 percent. A considerable part of the country's motor fuel is refined outside of Colombia and re-imported. The government is planning to increase refinery capacity sufficiently to meet all local demands, which totaled 3.23 million barrels in 1949 compared with 2.91 million barrels in 1948. About 59 percent of national consumption was refined locally in 1949. So far this year, Colombian demand is running about five percent higher than in 1949.

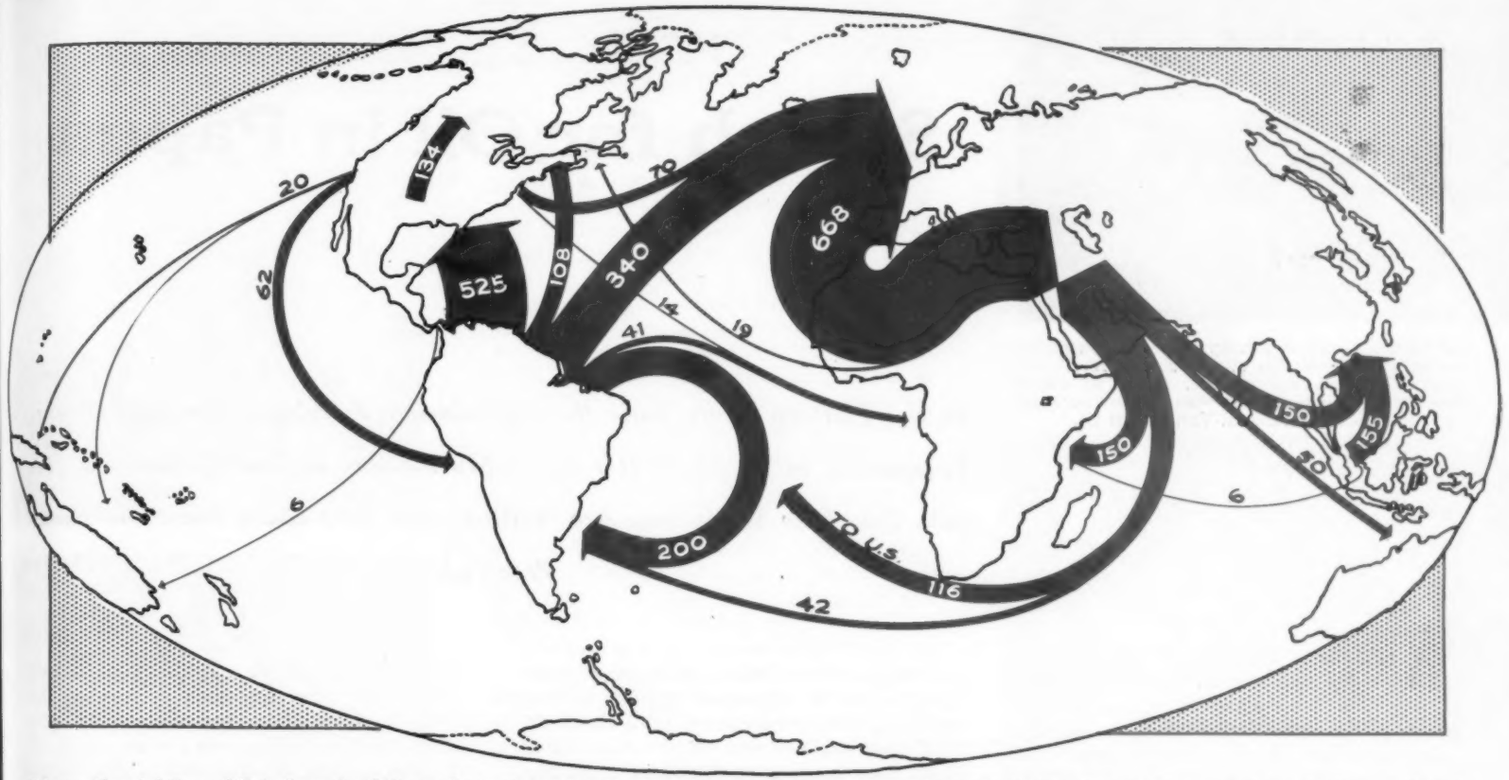
Currency difficulties have restricted consumption in Chile so that demand is showing no tendency to rise. In 1949 there was a reduction of 16 percent in production, much of the cut being in asphalt.

Cuba, which consumes more than 38,000 barrels of oil per day, is using about six percent more petroleum than a year ago. Some other islands in the West Indies are increasing even more rapidly. Haiti, for example, imported 36.2 percent more oil in 1949 than in 1948 and is enjoying good business again this year. Imports in 1949 totaled 320,000 barrels, so very large percentages changes do not greatly affect Western Hemisphere as a whole.

Domestic consumption of petroleum products in Mexico has increased 138 percent since before World War II and still is rising at a rate which is causing Petroleos Mexicanos to expand its refining and distributing facilities at a rapid rate. Elsewhere in this issue is a description of the new Salamanca refinery which will process 30,000 barrels of oil daily. No sooner was this plant completed to ease the tight situation in the central zone than Pemex began to plan the construction of new plants on the Pacific Coast and in the northern part of the country. Demand for gasoline, kerosene, diesel fuel and lubricants is growing much more rapidly than that for fuel oil, which once was the backbone of the Mexican oil trade.

Settlement of the sterling question and the removal of rationing is exerting a considerable effect on oil consumption in the United Kingdom and in other British Commonwealth nations in the Eastern Hemisphere.

In the United Kingdom 90 percent of the gasoline was devoted to essential uses and 10 percent to ordinary motoring under rationing. When restrictions were removed, sales of motor fuel rose about 12 percent in the first six weeks. It has been estimated that this rate of increase will level off at around 7.5 percent a little later. If it is assumed that "essential" use in the United Kingdom has



Intercontinental flow of Petroleum in 1949 was featured by a continuing enlargement of movement from the Middle East to Europe and a reduction of United States exports. Arrows in chart are not intended to indicate route followed, e.g., flow from United States to Latin America is largely from Gulf Coast rather than Pacific Coast, and from Middle East to United States flow is through Mediterranean but is shown as is for purposes of simplification.

not been affected by derationing, it appears that "unessential" demand has more than doubled.

In Australia where gasoline was derationed earlier, it has been estimated that the added increment due to this factor is on the order of eight percent. However, that may be, the record of motor fuel sales in the first four months was 4,663,000 barrels compared with 3,877,000 barrels in the same period last year. The increase was more than 20 percent.

New Zealand consumption was 13 percent higher in 1949 than in 1948.

The government of India lifted rationing on July 1 in Bombay, Madras, Calcutta and in the states of Assam and Manipur. Lack of adequate transportation prevented complete relaxation of controls, but there was an increase of 15 percent in allocations everywhere in the nation. Estimates of the effect of this move is that motor fuel demand may rise about 50,000 barrels per year.

Although derationing is having an effect currently, the basic strength of the oil trade in Europe today rests on the increase in number of commercial vehicles and agricultural implements consuming petroleum. Petroleum Press Service recently reported that Europe now has 651,400 tractors in service on the farm, one to 390 acres of arable land. Before the war Europe had only 174,500 tractors, one to 1,500 acres.

The increase in commercial vehicles is somewhat less striking. Before the war there were 2,471,200 registered commercial vehicles, and at the end of 1949 the number had increased to 5,234,400. Only country to show a decrease is eastern Germany.

The current Economic Plan for 1950 announced by the Polish government projects a 22 percent expansion of industrial activity this year. Mechanization of farming and road transport is being fostered by the government with a consequent increase in oil demand. Before the war the old Poland consumed about 2.8 million barrels of oil per year, and this now has risen to around 4.4 million barrels.

Polish oil refineries had a capacity of some 7,000 barrels daily before the war, and it is reported that throughput may be built up to about that figure this year. Domestic production is running about 3,400 barrels daily, and imports of crude from the Middle East through agreement with Great Britain about 2,500 barrels per day. Synthetic oil production from coal hydrogenation is about 2,000 barrels daily. Some refined products are being imported from other Russian satellite countries.

With production now in excess of 700,000 barrels daily, authorities in the U.S.S.R. are pushing the construction of new refining capacity. Reports are that capacity currently is just about in line with production at roughly 35 million metric tons per year.

Imports of petroleum products into Ireland in the first six months of 1950 were 12 percent higher than in the same period last year. Kerosine imports were 20 percent lower but both gasoline and heavy oil importations were up. Gasoline imports totaled 37.1 million gallons compared with 30.4 million gallons in the first half of 1949.

In the fiscal year ended June 30, 1950, the Economic Cooperation Administration has estimated that Marshall Plan countries consumed ten percent more refined petroleum products than in the previous fiscal year. Estimate for the year 1949-50 was 46.2 million metric tons or about 920,000 barrels daily. In the previous year the ECA reported consumption at 42 million metric tons or about 840,000 barrels daily.

Before the outbreak of World War II the nations now cooperating with ECA consumed about 600,000 barrels of petroleum products per day. Current consumption thus is about 50 percent higher than prewar. The accompanying tabulation is the Economic Cooperation Administration estimate of European consumption in the cooperating countries during the year ended June 30, 1950, compared with the previous 12 months.

Operations in the first half of 1950 before the Korean trouble began indicated that petroleum consumption had resumed its historic rate of rise which had been interrupted during part of 1949. With the world's economy somewhat stimulated during the coming months by rearmament programs, it seems likely that the consumption curve will continue upward, at least in the immediate future.

Consumption of Petroleum Products by ECA Nations

Ships' Bunkers Not Included
Barrels Daily

Country	June 30, 1948-1949	June 30, 1949-1950	Percent Increase
Austria	8,740	9,480	9.6
Belgium, Luxemburg	31,380	33,340	6.3
Denmark	23,800	24,240	1.9
France	166,640	178,000	6.8
Western Germany	41,200	56,420	37.0
Greece	15,280	17,860	16.9
Iceland	2,820	3,540*	25.5
Ireland	9,440	10,960	16.3
Italy & Trieste	75,740	75,720	0.0
Netherlands	44,540	48,860	9.7
Norway	26,940	30,180	12.0
Portugal	11,280	13,400	18.7
Sweden	50,900	52,180	2.5
Turkey	10,680	11,460	7.3
United Kingdom	321,340	358,840	11.7

*Includes about 440 barrels daily of International ship bunkers

Inland from the low, swampy shore Papua offers features for geological study such as Hombrum bluff of astrolobe agglomerate. Except as otherwise noted all photographs with this article were supplied by Standard-Vacuum Oil Co.

Search for Oil in Papua

In the Thirteen Years Since the Australasian Petroleum Company Began Prospecting in Papua, It Has Spent $19 Millions without Commercial Result. Two New Wells Now Are Drilling, and Two More Locations Being Prepared.

WITH more than a million motor vehicles on the road and an actively growing economy requiring petroleum, the Commonwealth of Australia has increased its oil consumption more than 80 percent since prewar. Current demand is on the order of 4.4 million tons per year. In the 12 months prior to the removal of rationing, Australian consumption was 3,630,000 tons.

This rapidly growing consumption has stimulated oil companies serving the Commonwealth to conduct an intensive search for a domestic supply of crude. Thus far, the only commercial production is a small amount of shale oil retorted at Glen Davis in New South Wales. A small amount of crude oil has been produced in the Gippsland district in Victoria.

Although Shell Development Co. commenced exploratory work in Queensland as long ago as 1940, no oil has been found. The search was suspended during World War II but has been resumed since that time. A wildcat now is being drilled at Morella in central Queensland. Late in June the well was drilling at 1,600 feet, after cementing 10¾-inch casing at 1,505 feet. The well will be carried to 10,000 feet if necessary.

Most promising area for oil production under control of the Australian Commonwealth in the view of many is in Papua in the Southeastern part of New Guinea. In this area exploratory work was begun before World War II by Australasian Petroleum Co. Pty. Ltd. (APC). A well site was selected at Kariava and drilling had progressed to about 5,000 feet when it became necessary to shut down in December 1941, because of advances in that direction by the Japanese. Drilling was resumed in 1946 and continued until March 25, 1948, when the hole was abandoned as dry at 12,621 feet. A second test at Oroi was spudded on Sept. 11, 1948 and abandoned Nov. 10, 1949, at 5,516 feet without finding a commercial show of oil or gas.

Papuan employees of Australasian Petroleum Co.

APC is owned 40 percent by Anglo-Iranian Oil Co. Ltd., 40 percent by Vacuum Oil Co. Pty. Ltd., and 20 percent by Oil Search Ltd., which represents Australian capital. The company was organized in 1938 and thus far has spent more than $19 millions in seeking oil for Australia. Its postwar operations have now been stepped up so that three wells are being drilled, and preparations are being made to start two more. The company employs a staff of 400 Australian and British and 2,300 New Guinea workers.

Most recent operation commenced by APC is at Wana, where drilling began on May 6. The Wana site was selected entirely on the basis of geophysical surveys as no surface geological indications can be found in the low-lying ground surrounded by dense, swampy jungle. The ground level is only about a foot above high water and hence presented even more difficulties than usual in what is always a difficult area in which to operate. The annual rainfall in the area is about 200 inches. The jungle seems to drip continuously. To complicate matters, there is little or no gravel to be had for road building or area surfacing.

Despite the difficulties, within a year's time APC cleared and drained the drilling site, built a wharf and a railway to handle incoming supplies, built housing facilities for 180 persons and erected the National "50" rig with its 136-foot derrick. Amenities for the personnel have included a hospital for British and Australians, a hospital for Papuans, offices, geological laboratory, machine shops, electric power plant, 20 houses, 10 large huts, a messhall and a club. Cost of getting ready to drill was on the order of $100,000, not counting the rig itself, which cost an additional $750,000.

Remarkable progress for Papua was made on the Wana well, once drilling was begun. In the first three weeks an average of 125 feet of hole was made per day and 819 feet of 13⅜-inch casing was run and cemented. At the end of June the well was drilling below 5,000 feet, not having encountered severe difficulties with heavy shale or "mudstone," which has given much trouble in other parts of the island.

The next well planned by APC was to be drilled at Malalaua. Preliminary work was well along and rig building in progress, when it was decided to suspend operations for the present. A camp is being built at Omati, while at Orloli current operations are confined to clearing the drilling site, road building and clearing the river of snags so that heavy equipment can be landed.

Difficulty with "mudstone" has kept drilling rates at Hohoro and Upoia far below those achieved at Wana. The Upoia test was spudded in on Jan. 24, 1949, and a year later the total depth was only 2,662 feet. Having gotten through most of the heaving or plastic mudstones at this point, having sidetracked frozen drillpipe and cemented the 13⅜-inch casing, operators have since been able to make much better time. At the end of March the well was drilling at 3,788 feet, and at the end of May total depth was 5,194 feet, where six-inch casing was cemented.

The Hohoro wildcat was spudded in on March 21, 1949, after a year and a half of preparatory work at the drill site. After a full year of drilling the well was down only to 4,721 feet. Since that time the company has been having difficulties trying to condition the hole prior to setting casing. At Hohoro the mudstone was first encountered at 2,050 feet and continued to the present depth. Efforts to shut off cavings have been ineffectual, and it has become necessary to abandon this well at a depth of 4,721 feet and to start a new well in what is considered to be a more favorable location.

One of the main difficulties in dealing with the mudstone is that unavoidable transport difficulties between headquarters and Hohoro have created periodic shortages of vital materials such as barytes. Without it, the rig

Hohoro wildcat which has had to be abandoned because of "mudstone" difficulties. Photo by V. Gadsby for Commonwealth of Australia, department of information.

←

crew finds itself forced at times to improvise. The well recently required 200 tons of barytes per week to condition the hole.

"New Guinea is much younger, geologically, than the Australian continent," Dick Mott, geologist on the well, explains. "The mudstone here is what we call Bentonitio. When you are drilling, it forms a very viscous mud. We cannot add water to reduce viscosity because this also reduces the weight below the necessary figure. So we then have to devise chemical treatments to reduce that viscosity, and they must be suitable for this particular type of mudstone. With the experience we have had so far, it is not very clear whether the geological formations are very broken or not, because we are drilling in areas probably disturbed by faulting. Whether our troubles with the fractured formations are due mainly to faulting or the type of formation itself is not yet quite clear.

"We have a mud engineer working all the time on investigation methods of controlling the various properties of the mud so that we can handle it and keep the hole clean. At present our particular worry is in respect to weight, that is, to squeezing in of the hole drilled through mudstone. Salt water coming into the hole has been a problem, too. However, we have very little gas."

N. A. Osborne, the company's chief geologist, reported: "The Tertiary strata are strongly folded. When the drill hole gets down to between 1,000 and 2,000 feet, very high pressures are met. Some of the strata contain gas and some water. We hope that some of them will also contain oil," he said. "When we strike gas and water under high pressure, we have to put a back-pressure on the drilling tools to stop them from being forced out of the hole. Also because of high pressures, there is always a tendency when the hole is cut for the softer rocks such as mudstone and shale to be squeezed into the hole. This continues for as long as the hole is open. To prevent that, we have to carry back-pressure.

"This is done either by drilling under pressure or, preferably, by drilling with a heavy mud. The weight of the mud is adjusted so that it is just sufficient to overcome the formation pressure.

"Back-pressure occurs elsewhere in the hole than at the point of drilling, but in some places it is not very high. The mud has to be under careful adjustment because, as the hole is cut—especially in mudstone formations—the mud itself goes into suspension with the water and, being of lower specific gravity, reduces the weight of the mud so that we have to keep on watching specific gravity and adding fresh weighting material in the required proportions."

Viscosity of the mud at Hohoro is kept down to a required figure of about 20 by adding chemicals, while addition of barytes gives

Gas seepage near Hohoro which will give bursts of flame when lighted. Australian official photograph by V. Gadsby.

Papuan employees working with Australians on Hohoro rig. Australian official photograph.

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Jungle home of Henry F. Eggington, assistant driller at Hohoro, with his wife the former Miss Jackie Johnson of Leesville, La. Australian official photograph.

Port Moresby where field headquarters of Australasian Petroleum Co. are maintained to direct the Papuan search.

Staff tennis court at site of a Papuan deep test.

Aerial survey of junglecovered coastal delta area in Papua.

G. A. V. Stanley, field geologist in his tent in Papua.

Dr. M. Glaessner, chief palaeontologist for Australasian Petroleum Co. at Port Moresby laboratories.

Papuan assistant in Port Moresby Palaeontological laboratory.

The motor ship "Kosami" employed to keep geological and geophysical field parties supplied.

the mud the required specific gravity of 1.7 to 1.72, yet keeps the mud fluid. In mudstone the viscosity goes up to 100 plus very quickly. Samples are constantly tested so that any marked irregularity may be promptly corrected.

Earlier drilling ventures in Papua were less successful before present drilling methods were developed to deal with heaving or plastic mudstones through pressure drilling and mud conditioning. On a hill near the Hohoro well still stands a small derrick erected in 1923 by the now defunct Australian New Guinea Oil Co. This firm was able to drill 1,326 feet in five years before giving up its struggle against the mudstone.

Many of the young drillers working on the Hohoro rig are trainees who have worked on wells in heaving shale areas in other countries. The APC sends promising young men to Iran and the United States for training before sending them to Papua.

Typical of these is Henry F. Eggington, assistant driller from Melbourne, who spent nine months training on location in Louisiana. While there, incidentally, he met Miss Jackie Johnson, married her and brought her back to Hohoro. This charming girl, still in her teens, is now one of five white women on the station. The Eggingtons live in married quarters supplied rent-free by the company and have a Papuan servant.

The men have their club, run by an elected committee, and with a fee of only five shillings a month. The company supplied the furniture. Meals and accommodation are supplied free to employees—practically all that the men have to pay for is their tobacco and liquor.

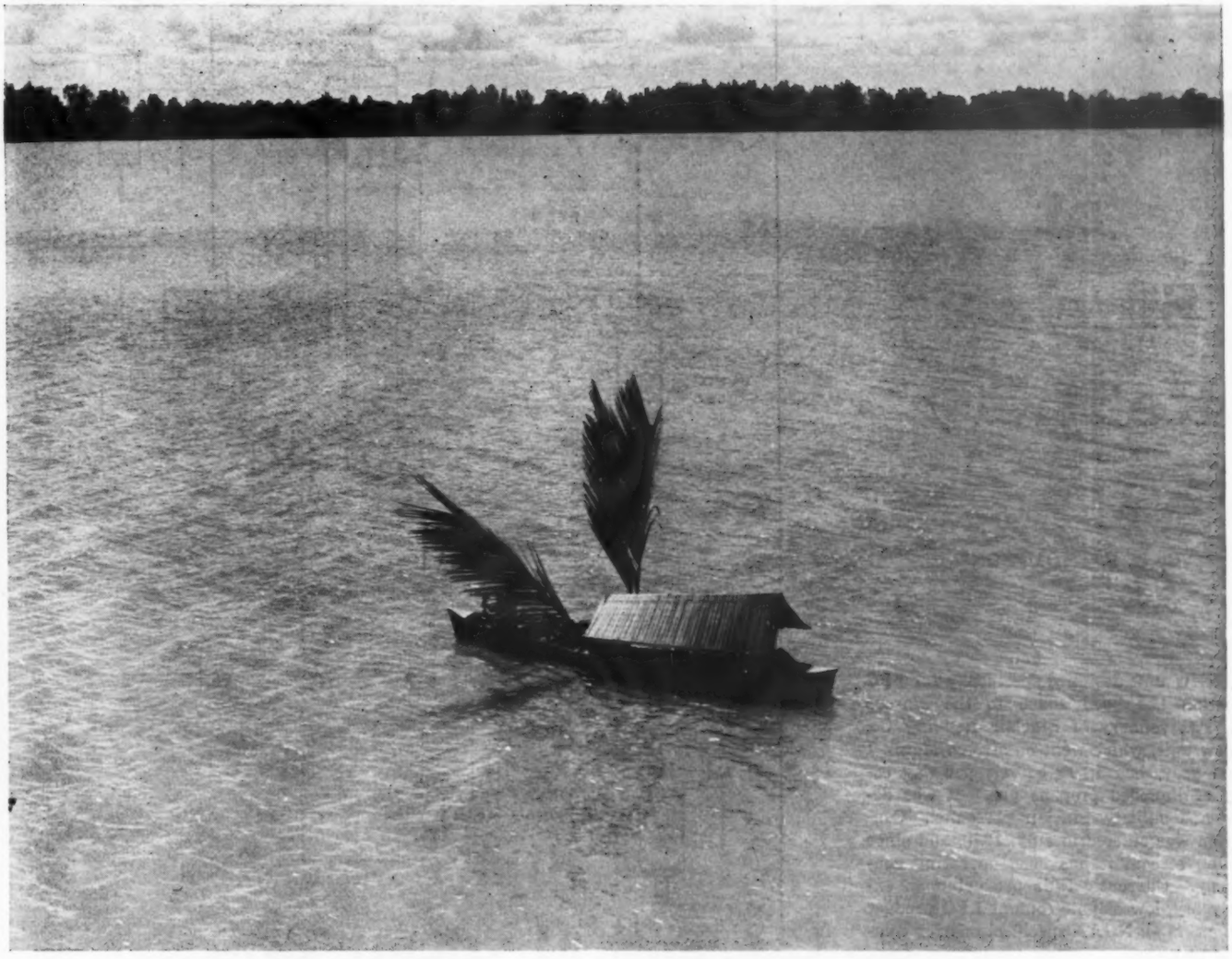
At Ihu, the base for Hohoro operations, is a medical clinic for Australians and Europeans, with a medical assistant, Hayden Courtier, in charge. There is also a hospital with a trained medical assistant and medical orderlies under the general supervision of Mr. Courtier for Papuans. All medical treatment is free of charge to all employees. The company supplies the latest drugs and most modern treatments.

The medical assistant can get in touch by two-way radio with the company's chief medical officer in Port Moresby, Dr. D. Finlay. If a man is too seriously ill or too badly injured to be treated adequately on the station, he is sent to hospital in Port Moresby by plane. In other cases Dr. Finlay may fly to the station to see the patient. The radio system is also available for messages between Hohoro and other field stations.

The road to Ihu is muddy, slippery, full of potholes, except for one formed and graveled section. Shortage of gravel in these areas is one of the great road-building problems. At Ihu there are base stores, sawmill, landing workshops and stores, and depot for operations on the Vailala River. Here, as at the well, the houses are mostly of timber and water-proofed paper. A three-and-a-half mile pipeline runs to Hohoro to supply fuel oil for the rig.

Although the climate on muddy, dripping Papua is far from pleasing, APC has done much to make the venture as pleasant and profitable as possible for its technical and supervisory staffs. Meanwhile, the company has increased its nominal capital to 7.5 million Australian pounds and continues its expensive 13-year-long search for a domestic supply of oil for Australia.

With 200 inches of rainfall it is essential to cover working and supply areas while drilling in Papua.



PIX

SCHLUMBERGER, TOO, HAS SAILED THE MAHAKAM

In Borneo, where practically no roads cut through the jungle, transportation is river-borne.

In keeping with the Schlumberger aim of following the drill . . . wherever it goes . . . a service center was established in the oil fields of Sanga Sanga in 1937. Destroyed at the time of the invasion, it was rehabilitated in 1946.

SCHLUMBERGER OVERSEAS, S. A.

c/o N. V. de Bataafsche
Petroleum Matschappij,
Sanga Sanga, Borneo

LPG Unit at Sinclair Refinery

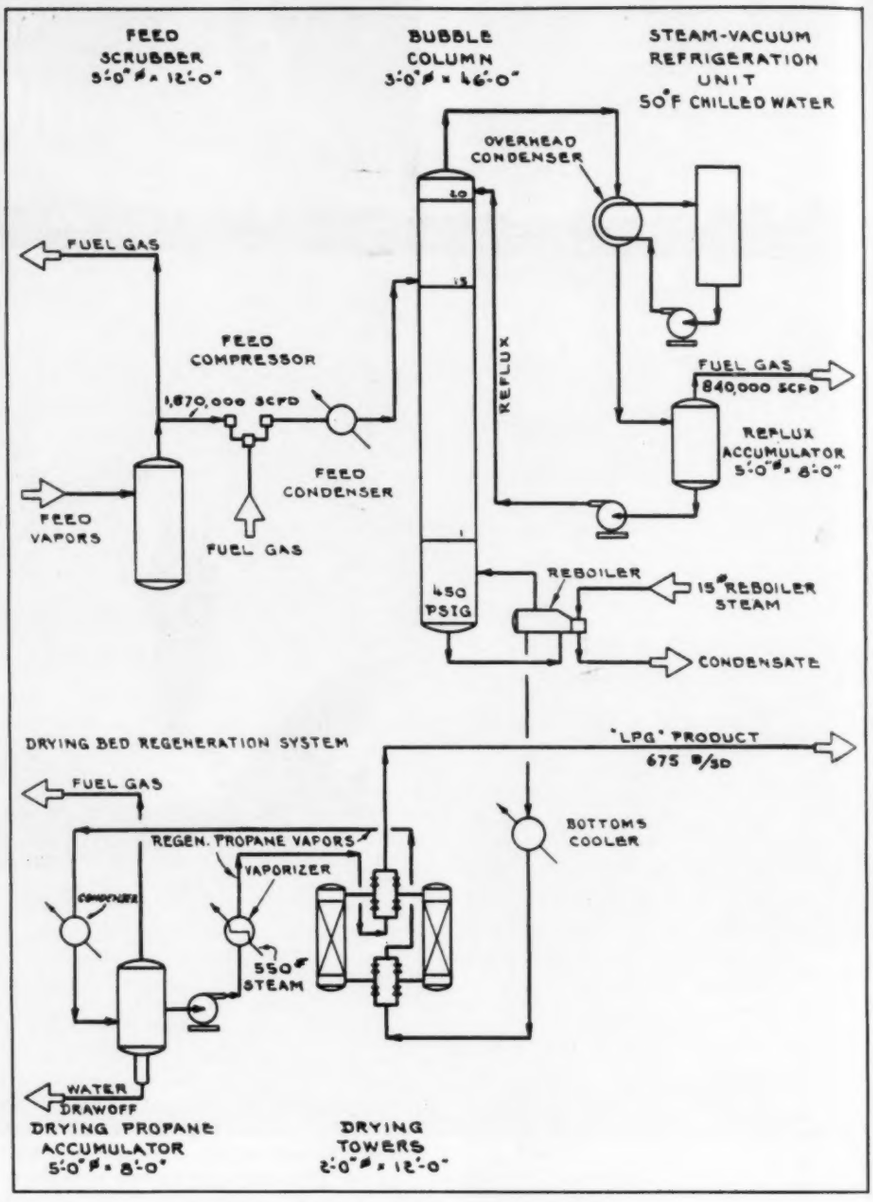
By H. F. THOMPSON*

A NEW unit designed specifically for LPG production has been added to the Marcus Hook, Pa., refinery of Sinclair Refining Co. The new unit, which went on stream March 1 of this year, has 1,100 barrels per day capacity of liquefied propane gas. It was designed and built by Sinclair personnel. Construction was started in July, 1949, and since going on stream it has been operating continuously. Currently it is producing an extremely dry, low olefinic content LPG product which meets all NGAA specifications for commercial propane.

This operation was undertaken to meet the steadily increasing demand for liquefied petroleum gas in the North Atlantic seaboard area. Heretofore shipments of LPG to this market were made from the midcontinent area, but this involved high freight rates and delays in transportation. Hence it was decided that a source of supply nearer to points of consumption was necessary.

In this new plant the butanes and lighter hydrocarbons are recovered from cracked distillated stabilization operations and treated in sequence with diethanolamine and caustic solutions for the removal of hydrogen sulfide and mercaptans. The hydrocarbon stream is then subjected to a high pressure (1,000 psig) catalytic polymerization operation wherein 85 to 90 percent of the propylene-butylene content is reacted. The propane and lighter hydrocarbons stream from the polymer depropanizer are charged via gas driven reciprocating compressors to a 20-tray de-ethanizer which fractionates out 85 to 90 percent of the propylene-propane content of the charge for LPG sales. The composition of feed, overhead and bottom streams of the de-ethanizer operations are shown in Table I:

* Chief, technical department, Sinclair Refining Co.



Flow diagram of propane LPG production.

Table I

	Feed Mol. %	Release Gas Mol. %	LPG Liq. %
Methane	4.6	10.2	—
Ethylene	4.7	10.5	—
Ethane	29.9	65.5	0.5
Propylene	4.6	2.0	4.0
Propane	56.2	11.8	95.5
	100.0	100.0	100.0

A 126 ton-day capacity steam jet refrigeration unit is used during the warmer months of the year to provide 50°F cooling water for the reflux condenser of the de-ethanizer. A stuffing-boxless type centrifugal pump has given trouble-free operation in the rather difficult de-ethanizer reflux service. In order to prevent "frosting" of the overhead release gas pressure control valve and the downstream line from the same, an all-welded shell and tube steam heater was installed between the gas outlet from the reflux accumulator and this gas release valve. LPG, the bottoms product of the de-ethanizer column, flows on level control from a cooler through an activated alumina drying tower and thence into "bullet-type" storage vessels. Three such vessels of 600-barrel capacity each have been provided along with tank car and truck loading facilities.

Regeneration of the alumina is accomplished by stripping the adsorbed water from the drying beds with 3,500°F propane vapors. A closed system is employed from the regeneration of the alumina beds and consists essentially of a propane accumulator, a small centrifugal circulating pump, a vaporizer in which 550 psig steam is used for vaporization and superheating and a water-cooled exchanger to condense the propane and water vapor effluent from the drying bed. The water desorbed from the drying bed separates out in the accumulator and is withdrawn from a well at the bottom of the accumulator. The towers are currently on a 24-hour drying cycle with regeneration now being accomplished in 6-12 hours.

General design and current operations of this unit are as shown in flow diagram herewith.

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Residual Oil Utilization

Recent Developments Indicate that Residual Oils, Now a Burdensome Refinery By-Product, May Be Moved into a More Profitable Market.

By Dr. O. W. Willcox

TWO recent developments suggest that heavier fractions in the barrel of oil may become more valuable, thus tending to take them out of the "by-product" classification which has caused them to be produced and sold at a loss much of the time. One of the two new developments now is being applied on a commercial scale in the manufactured gas industry. The other, which involves usage of heavy oils in a new type engine, is still in the laboratory experimental stage.

A report recently was made to a meeting of the Canadian Gas Association on the manufacture of gas of high Btu content from heavy fuel oil. This announcement holds promise to the oil industry of a new market for its residual oil, in that the manufactured gas industry will be enabled to dispense with the use of coal or coke and distillate fuel oil, and to compete with natural gas through a lowering of manufacturing costs.

It may help solve the problem of stand-by and peak-load leveling in connection with distribution of natural gas. The process, which was developed by research of the American Gas Association, has been working for a year in a plant in Cambridge, Mass., and is being installed in several other cities. It produces a gas of about 950 Btu, which is virtually the same as natural gas but can easily be diluted for consumer use.

The benefit to the gas manufacturer is that he can increase his capacity for producing 530 Btu gas by 80 percent or more by making plant alterations that will cost less than 15 percent of the total fixed capital of a gas company.

Furthermore, gas manufacturing costs can be reduced 15 to 20 percent by producing oil gas instead of carbureted water gas. In addition, besides the increase of manufacturing capacity, there is obtainable an increase of 80 percent in distribution capacity by slight changes in consumer appliances. This saving comes through distributing greater heating value through the system. The change-over cost for this improvement is said to be moderate.

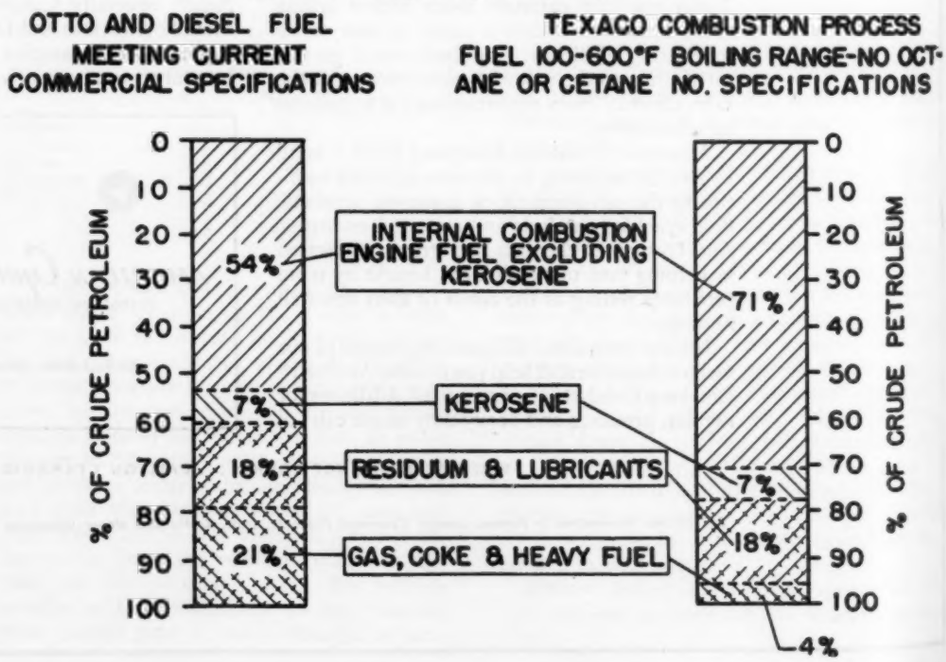
It is not shown how much residuum the manufactured gas industry can take off the hands of the refiners, but the movement may be regarded as a contribution to conservation by upgrading petroleum values.

More to the point for the refiner's overall results is the uncovering of a new principle of internal combustion engines reported to the SAE by Barber, Reynolds and Tierney of The Texas Company's Beacon Laboratories. As such engines, operating on the Otto cycle, are now constituted, they are rather "selective in their fuel diet" and can use only a portion of the petroleum that is potentially available as liquid fuel. Furthermore, the efficiency with which the Otto-cycle engines convert the heat energy of the fuel into mechanical energy is low—about 10 percent at full load and about six percent at normal load. Very much of the research effort expended by the petroleum and automotive industries has been directed toward widening engine efficiency by increasing compression ratios, more satisfactory spark timing, burning leaner mixtures, and by catalytic cracking and polymerization processes, all of which have allowed an increase of some 60 percent in amount of fuel produced per unit of crude oil, and a great increase in octane numbers. This has spelled more miles per gallon, more gallons per barrel of crude, lowering of power costs—all contributing to conservation by upgrading. But still the refiners feel that they are left with too much heavy, low priced residues on their hands.

The new engine invented by Barber, Reynolds and Tierney, which operates on what is called the Texaco combustion process (TCP), which is covered by U. S. Patent 2,484,009, shows evidence of ability to take a large bite out of the lowest-grade refinery residues. The Otto cycle has the disadvantage of being sensitive to knock, and engines for this cycle have to be designed with one eye on compression ratio and the other on octane or octane number. The TCP engine disregards these limitations. As set forth by its inventors, TCP is a method for operating the combustion phase of the cycle of a reciprocating internal-combustion engine in such a way that knock does not occur, regardless of the octane or cetane number of the fuel, and regardless of the compression ratio or supercharge of the engine. TCP is relatively insensitive to fuel volatility, and it readily handles fuels of a broad boiling range, such as 100 to 600°F. The features of TCP that prevent knock also allow a wide range of mixture strengths to be burned. These add up to greater power per unit of engine size, more miles per gallon of fuel, more gallons of fuel per barrel of crude petroleum.

The difference between the conventional Otto cycle and TCP which accounts for the

Chart indicating the greater fraction of crude which might be used as internal combustion engine fuel in engines of the type being developed by The Texas Co.



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radical differences in their performance may briefly be explained as follows:

In the Otto cycle engine the cylinder is filled with the combustion mixture, in which a flame front has been established at the spark plug and is burning into the mixture, compressing ahead of it the unburned portion of the combustible air-fuel vapor mixture. This whole process may be regarded as a race between two processes: the rate of travel of the flame front, and the rate at which the remaining fuel mixture is being compressed. If the flame front reaches the opposite wall of the cylinder before the remaining gas has been compressed to the point where it will ignite spontaneously, there will be no knock. If the remaining gas explodes before the flame front has arrived, knock will occur. The necessity of balancing these rates is what imposes limits on the functioning of the Otto cycle engine.

On the other hand, the TCP engine is designed so that the mixture of air and fuel vapor has a swirling motion. By regulating the distance between spark plug and injector, the "time of residence" of the combustible mixture in the chamber at combustion chamber pressures and temperatures can be reduced, and the flame front can do its work with exclusion of conditions that produce spontaneous ignition and knock. It is this arrangement that makes all the difference.

The inventors compare the Otto engine, the diesel engine and TCP in the following terms: The Otto cycle operates at high output and high fuel consumption and is limited on the lean end by misfiring. The diesel engine, on the other hand, operates at a low fuel consumption but also in a lower range of output, never attaining the high output of an Otto cycle engine. In contrast with the curves of these two extremes, the TCP curve covers the range of both the other cycles and merges them into a single curve which approaches both the low fuel economy of the diesel and the high output of the Otto cycle. Thus the TCP combines, in a single operation, the two best features of Otto and diesel engines, namely, the high part-load of the diesel and the high full-load power of the Otto cycle engine.

Where does all this leave the refiner? Where it leaves him may be seen from the accompanying diagram, which illustrates what happens to crude petroleum when the refiner makes automotive fuel for Otto and diesel engines, and what could happen to the same crude if he made fuel for TCP engines. In the first case he would turn 54 percent of the crude into fuel for the existing types of internal combustion engines; the other 46 percent consists of 7 percent kerosene, 18 percent of residuum and lubricants, and 21 percent of gas, coke and heavy fuel. When making fuel for TCP engines which can use anything that boils between 100 and 600°F, he would get a yield of 71 percent of usable, knockless fuel which can be employed directly, without regard to octane or cetane number and without regard to compression ratio. However, with TCP, the refiner will still have seven percent kerosene and 18 percent residuum and lubricants, but his residue of gas, coke and heavy fuel shrinks from 21 to a mere four percent. The TCP thus makes little or no impression on the 18 percent of residuum and lubricants, but it means a good deal to avoid production of so much gas, coke and heavy fuel.

What he gains is that part of the crude which usually goes into these tail-end residues is obviously highly upgraded into higher market values.

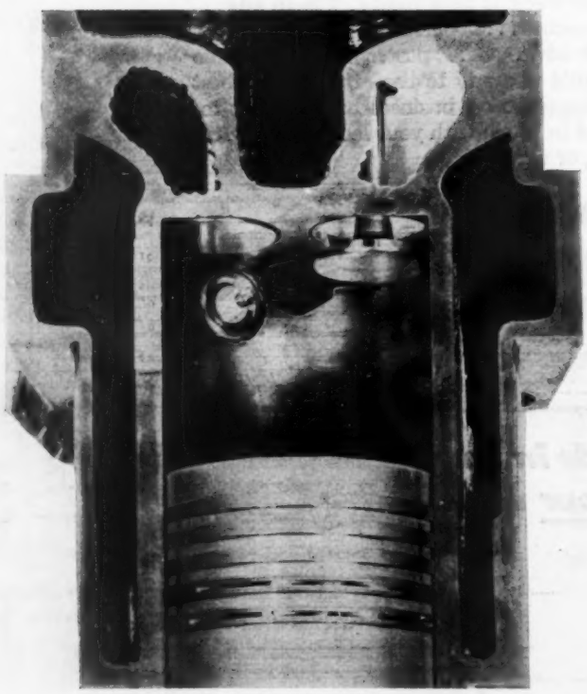
As regards the 18 percent of residuum unusable by TCP, which includes lubricants, the Bureau of Mines has lately come up with a proposition to transform the heavy residual oils into distillate fuels "in some areas." This proposition, as summarized by Skinner, Donath and Frese*, is an adaptation of what the Bureau of Mines has learned about plant equipment and operating costs for producing gasoline by coal hydrogenation. They present a flow sheet showing how the refiner may convert heavy residual oil (specific gravity 1.02, 7° API; viscosity above 300 SSF at 122°F) into high quality distillates: diesel fuel, kerosene, jet fuel, gasoline, etc. Commercial and pilot plant experience indicates that, on a calendar day basis, 17,200 barrels of distillate products can be produced from 16,500 barrels of residuum feed stock. The main products are high grade diesel fuel and motor grade gasoline. These products are characterized as essentially saturated and low in sulfur and nitrogen, regardless of the feed material. The processing of sour crudes thus presents no special problems.

The proposition depends on hydrogenation at a pressure of 1,000 psi, because at this pressure cracked residues, regardless of type and origin, can be processed with high throughput and yield; in some cases lower pressures may be used. The costs are less than in coal hydrogenation, not only because of higher throughput but also lower cost for hydrogen, power and steam consumption, and omission of coal-handling equipment. Of the 16,500 barrels of original residue, 2,020 barrels (11 percent) appear as a heavier residue that is too refractory for further hydrogenation and is fit only for boiler fuel, which the refinery needs in any event.

The Bureau of Mines supports its proposition with engineering calculations showing that hydrogenation of residual oil is now economically feasible. These calculations show that the pay-out time will be four to six years in midwestern and California areas and five to eight years in the Atlantic coast area. Estimated plant costs are $1,800 to $2,000 per daily barrel of product.

The upshot of these moves to upgrade the fag ends left from fuel production for Otto and diesel engines is to reduce the final residue of gas, coke and unworkable heavy residue from 21 percent to about four percent. Aside from this residue and what is marketed as kerosene and lubricants, all the crude oil can be marketed as automotive fuel of high use value. That is, much more of the refiner's output could move into the higher price brackets.

*Petroleum Refiner, July, 1950; p. 83.



Left: Sectional view of Texaco engine.

Below: General arrangement of experimental apparatus.

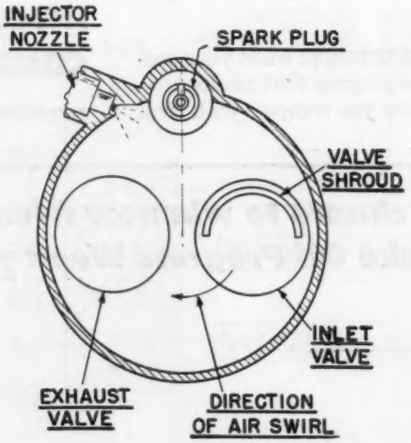
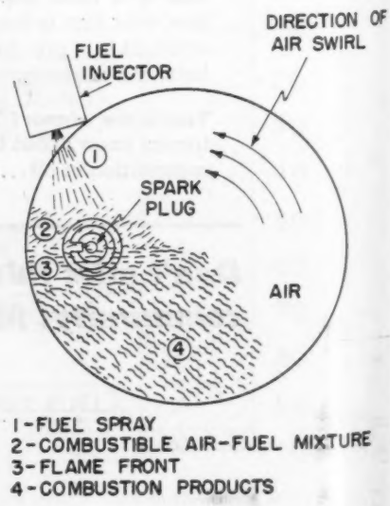


Diagram of the Texaco combustion process, air swirl method.



What's ahead for heavy oils?

During the last world war a serious shortage developed in the supply of Electrode Carbon. With the nation again engaged in defense preparation, refiners interested in disposing of heavy residues in this broad, highly profitable market may find it to their advantage to utilize the Curran Liquid Hydro-Carbon Coking method for the conversion of their heavy oils.

The Curran Process, a flexible and economical method of high temperature coking, provides the ideal means by which residuums are converted to high quality Metallurgical Coke or Electrode Carbon.

Analysis Offered Without Obligation

Conclusive tests in our pilot plant with your material may well prove it to be the key to greater profits for you. The assistance of Curran Coking Specialists is at your disposal without obligating you in any way. Tests are conducted at our actual cost and your representatives are invited to be present. For full details wire, write or phone.

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International news and notes

Basil R. Jackson

Jackson Appointed Deputy Chairman

Basil R. Jackson has been appointed deputy chairman of the Anglo-Iranian Oil Company, succeeding Sir H. B. Heath Eves, retired. Mr. Jackson has been a member of the Anglo-Iranian board since October 1948.

Mr. Jackson was born at St. John's, Newfoundland, the son of the late Sir Henry Jackson, a former governor of Trinidad. He was educated at Downside and qualified as a barrister-at-law. In the 1914-18 war he served in the Royal Garrison Artillery in France and Flanders from 1915 until the Armistice.

He joined Anglo-Iranian in 1921 and worked for the next six years in the refineries branch and later as central administration manager, production department. He visited the United States in 1929, and in 1930 when the company decided to open an office in New York, he was appointed its representative in the United States.

In 1935 Mr. Jackson returned to the head office and remained there until shortly after the outbreak of World War II, when he returned to take charge of the New York office, where his extensive knowledge of the oil industry throughout the world, coupled with his wide experience of the company's own operations, equipped him to cope with the many difficult problems which arose there during the war years.

European Area Manager for Shell

Arnold Hofland, formerly general manager of Deutsche Shell A.G., has been appointed European area manager at the Shell head office, London, succeeding F. A. C. Guepin, recently appointed a director. Mr. Hofland is a native of Holland. He joined the Royal Dutch-Shell Group in 1929 and served in posts with British and European members of the Group until 1944, when he was appointed a civilian adviser to the Allied Armies in Italy. For his services in this capacity he was awarded the United States Medal of Freedom with Bronze Palm. In January 1946 he was appointed oil adviser to the Allied Military Government in the British zone of occupation in Germany. He was appointed general manager of Deutsche Shell A. G. on Jan. 1, 1948, a post he held until his new appointment in London.

A. de Graan, formerly general manager of Shell Italiana S.A., has been appointed to succeed Mr. Hofland as general manager of Deutsche Shell A. G.

British Columbia May End Gas Price Fixing

News reports from Vancouver, Canada, state that pressure is increasing for the ending of British Columbia's gasoline price-fixing policy. The province is the only one in Canada to retain control over gas prices, and it has been frequently criticized by oil companies for its restrictive legislation in petroleum matters. Refinery capacity in the province is too small to take care of the growing need for petroleum products, and leading oil companies have told the government that they cannot see their way clear to investing millions in new refinery facilities under the present legislation.

At its fall session the legislature will be faced squarely with the problem of whether to continue gas price controls or let the market find its own level through competition.

Announcement from Portland, Oregon, that General Petroleum plans to build a $24 million refinery there and will lay an oil pipeline to carry oil to it from Alberta and Montana fields, together with the new refinery projects at Winnipeg, Manitoba, and Edmonton, Alberta, has caused dissatisfaction among businessmen who would like to see some of that money coming to British Columbia.

Bourne Elected Vice President of Stanvac

A. W. Bourne, Jr., a director of Standard-Vacuum Oil Co. for the past three years, has been elected a vice president. He has a record of nearly 35 years' experience in the international oil business. After training for an overseas marketing career, he went to Java in 1916. Later he was transferred to Singapore where he became branch manager.

Assigned in 1936 to represent Standard-Vacuum in London, Mr. Bourne returned to the Far East three years later. In 1941 he was named general manager at Hong Kong, in charge of marketing operations in South China, the Philippines, Malaya, Indo-China, Thailand and Indonesia. In World War II he was interned for six months at Stanley Prison but was repatriated on the Gripsholm in August 1942 with the first exchange of internees. He then handled postwar planning for Stanvac at New York during the remainder of the war period, returning to Shanghai as general manager of the China division in 1945. He became a Stanvac director in 1947 when he rejoined the company's New York office.

A. W. Bourne, Jr.

Sir Hubert B. Heath Eves

Heath Eves Retires

Sir Hubert Bryan Heath Eves, who has been a director of Anglo-Iranian Oil Company since 1924 and deputy chairman since 1941, has retired after 40 years of service in the oil industry. He joined the Burmah Oil Company in 1909 and served for a time as the company's agent in the Burma fields, having charge of drilling and production. Subsequently he was transferred to Calcutta, where he became the general manager in India and as such directed the company's distributing operations in that country.

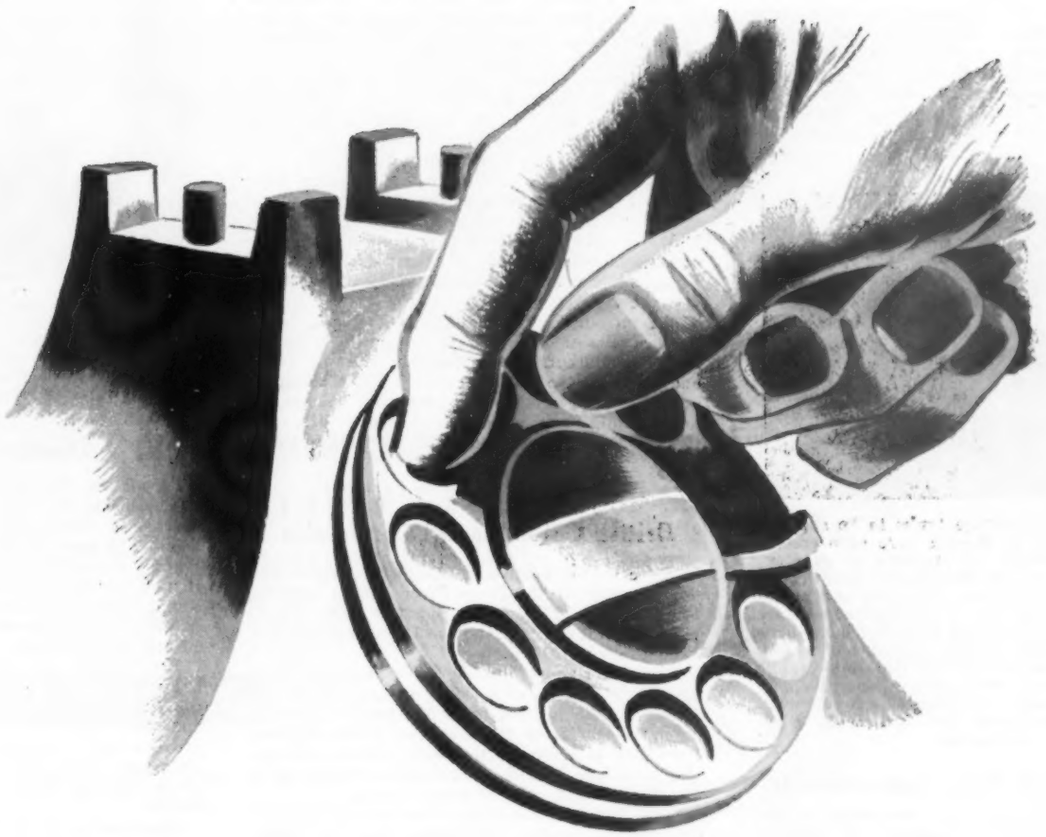
In 1914 when the Anglo-Persian Oil Company (as the Anglo-Iranian was then called), was establishing itself in world markets, Sir Hubert became its representative in India while still continuing as general manager of the Burmah company. Seven years later he returned to England to a key post in the London office of Anglo-Iranian, where he took a prominent part in establishing the company's British and continental marketing machinery. He also participated in establishing Anglo-Iranian's subsidiary companies in Africa which later became merged in the Consolidated Petroleum Company, the joint selling organization for Egypt, South and East Africa of the Anglo-Iranian and Shell Groups.

Taking a keen interest in ocean transport matters, he was closely associated with the work of building up the fleet of the British Tanker Company (Anglo-Iranian's transport subsidiary) to a million tons deadweight, which made it one of the largest ship-owners in the world.

His experience of tanker operations led to his appointment in the 1939-45 war as chairman of the Petroleum Board's Tanker Tonnage Committee, which operated the pooled British tanker fleet under the Ministry of War Transport. His successful conduct of this important office was recognized by the conferment of a knighthood in the 1946 New Year's Honors.

To Enter British Columbia

News reports from Vancouver, Canada, state that Union Oil Co. of California, through negotiations with McQueen, White & Dickinson Co. Ltd., importers and exporters, is planning to re-enter British Columbia, where it maintained a sales organization before the war. According to the report, plans call for an investment of $1,250,000 at Vancouver for a landing station, tank farm and other facilities. The company is also engaged in exploration in the Peace River district of western Canada.



Dependable Selectivity...

Efficient H_2S removal in the presence of CO_2

Dependable, low-cost removal of H_2S in the presence of large volumes of CO_2 is a primary advantage of the Shell Phosphate Process. All but harmless amounts of H_2S are removed while most of the CO_2 is left untouched.

Important too is the fact that the treating process has no harmful effect upon subsequent processing operations. The treating agent is inorganic . . . non-contaminating to hydrocarbons.

Low operating costs are the rule with the Shell Phosphate Process. Since a minimum of CO_2 is removed, steam regeneration of the treating solution costs less. Also, because the regenerated H_2S is in a relatively high concentration, the cost of conversion to solid sulphur or sulphuric acid is greatly reduced.

The Shell Phosphate Process is available to any operator under license from the Shell Development Company . . . together with experienced engineering service for its design, installation, and operation.

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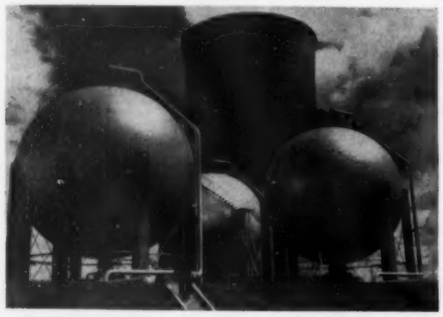
Albatros Refinery Report

The report of Albatros S. A. Belge pour le Raffinage de Petrole, formerly Redeventza S. A., shows that during 1949 the company processed 927,000 barrels of crude, all from the Middle East. The report, submitted by Maitre Leon Poncet, president of the company, states that its throughput, larger than that of any other refinery now operating in Belgium, represented over 36 percent of the country's refining operations. The Redeventza refinery was damaged and put out of action during the war. The company was reorganized in 1948 under its present name, and the plant was repaired and put into operation in January 1949.



The first spherical storage tanks to be supplied to any oil refinery in Britain have been erected on the site of Shell's new refinery at Stanlow, Ellesmere Port on the Manchester ship canal. These three spherical tanks, designed and manufactured by Whessoe Ltd. of Darlington, measure 35 feet in diameter and each holds 140,000 gallons of butane stored at a working pressure of 70 psi. Just completed on the site of this new Middle East crude refinery, which began operations in November last year, is the largest concrete cooling tower in the world—341 feet high. Shell photograph.

Imperial Marketing Appointments

A number of changes and promotions in the marketing department of Imperial Oil Ltd. of Toronto, Canada, have been announced by the company. George C. Bradley has been made assistant general manager of the department, succeeding H. R. Knowles who has retired. H. L. Magee becomes general sales manager, and C. T. Wright general operations manager, these being newly-created positions.

C. E. Tilston, formerly assistant manager of the Ontario marketing division, succeeds Mr. Magee as eastern regional manager. J. E. Akitt, who has been district manager in Manitoba, steps into the position formerly occupied by Mr. Bradley as western regional manager. L. D. Fraser, formerly manager of fuel oil and burner sales, moves into the post of district manager in Manitoba.

80-Mile Water Line

Shell and Creole Petroleum Company's refineries recently constructed on the arid and desolate Paraguana Peninsula of northern Venezuela now have an adequate and reliable water supply, through an 80-mile pipeline from the Siburua Springs, a natural water supply in the foothills of the San Luis range on the mainland. The line is 34 inches in diameter at its origin, narrowing to 30 inches for its major portion.

The branch line feeding Shell's refinery at Cardon is 20 inches in diameter, and that supplying Creole's installations 24 inches in diameter. A third branch line is also to be laid to supply the villages of Las Piedras and Punto Fijo. Although the resources of the Siburua Springs are believed to be sufficient to feed the new system during all seasons, nine wells have been drilled in the vicinity as an additional precaution, six of which will belong to the oil companies and three to the Venezuelan government. Williams Brothers laid the line.

The introduction of running water brings one more service to the miniature township of about 10,000 inhabitants which Shell has built for staff and labor at the Cardon refinery. This includes schools, clubs, a shopping center, a theatre, a hospital and many amenities of modern life, and the community is self-sufficient in almost every way.

British Columbia Oil Companies

Three new companies have been formed to develop acreage in the Peace River district of British Columbia. They are Edvan Oils Ltd., Monkman Pass Oil Co. Ltd. and the Lone Mountain Oil Co. Development Ltd.

Edvan has acreage in the Lone Mountain area and in the Pouce Coupe field. At Lone Mountain Edvan has 25 percent of 90,000 acres extending northwesterly from the block on which Phillips Petroleum is drilling a test well. Others sharing this area are Wilrich Petroleums, Spooner Oils and Jupiter Oils, with 25 percent each.

Lone Mountain has 30,000 acres directly east of the Phillips location. Monkman Pass Co. holds 45,000 acres, a northwest extension of the Phillips holdings.

Drilling for oil and gas in the Lower Mainland section of British Columbia and adjacent territory continues to hold interest of B. C. oilmen. The Allenbee South Brazeau well at Newton, 30 miles from Vancouver in the Surry district, is now down 255 feet.

A new well a short distance away on the United States side of the border, is being drilled by a joint Washington and Vancouver group. This organization, the Pleasant Valley Oil and Gas and Birch Bay Syndicate, reports its first well in the district hit gas at about 400 feet and is now capped at 120 pounds pressure. They now have a cable rig at Birch Bay down 90 feet.

C. T. Wright | George C. Bradley | H. L. Magee

The "Verena," second of four new 28,000-ton tankers for the Shell fleet, was launched from Harland and Wolff's Belfast yard recently. The tanker was designed to carry crude oil from the Middle East to Shell's new U.K. refineries. Shell photograph.

Alberta Gas to B.C.

Permit for the first movement of natural gas from Alberta Province was granted in July to the Westcoast Transmission Company, which now holds a 30-year permit to ship Alberta gas into British Columbia. Dawson Creek in northern British Columbia will in 1951 become the first center to benefit from the gas output of the rich Alberta fields. The permit covers the export of 13 million cubic feet.

The 17-mile line from the Pouce Coupe gas field in northwest Alberta was first approved by the Alberta Natural Gas and Petroleum Board and then received a final okay from the Board of Transport Commissioners at Ottawa. The Transport Board has specified that the Dawson Creek pipeline must be completed by Dec. 31, 1951.

Westcoast is one of the firms seeking the larger pipeline from Alberta to the Pacific Coast. Other firms seeking the same permit are the Alberta Natural Gas Co. and the Prairie Transmission Lines Ltd.

An American company, the Pacific Northwest Pipeline Corp., is viewing the Alberta gas fields with the idea of combining Alberta and Texas gas to supply the Pacific Coast. Vice president T. H. Jenkins says an application by the company is now before the Federal Power Commission at Washington, and gas may be made available in 1951. Mr. Jenkins said his firm has applied for 100 million cubic feet of Alberta gas daily to serve Vancouver and the huge Consolidated Mining and Smelting Co. plant at Trail, B. C.

Equipment Industry Active

The British oil equipment industry is busy meeting the demands of the oil industry, and there is no sign of any letting up according to the annual report of E. F. E. Howard, chairman of the Council of British Manufacturers of Petroleum Equipment. Sales in 1949 totalled £63.8 million compared with £61.1 million in 1948, and £46.8 million in 1947. The figures represent export sales to British companies only.

There are now 378 members of the Council, a marked growth over the past year. The council has been active in numerous ways in promoting the interests of the industry. It has cooperated with oil industry representatives in the development of standards and in the study of corrosion.

Advisory assistance to equipment manufacturers has been provided by the Council in a number of directions. A mailing list has been built up for advertising purposes. Advice has been prepared on packaging of export shipments and on sales travel in foreign areas.

New members of the executive committee elected at the recent annual meeting are: D. H. Carter, Head Wrightson Processes, Ltd.; L. S. Dawson, The Oil Well Engineering Co., Ltd.; and Edward Thompson, John Thompson, Ltd.

CAN YOU USE $18,000 ADDITIONAL PROFIT THIS YEAR?

IN THE AVERAGE REFINERY OR GASOLINE PLANT, THE GREATEST OPERATING EXPENSE EXCLUSIVE OF LABOR IS *Fuel*.

BORN "UPFLO" HEATERS TURN PART OF THIS EXPENSE INTO *Profits*.

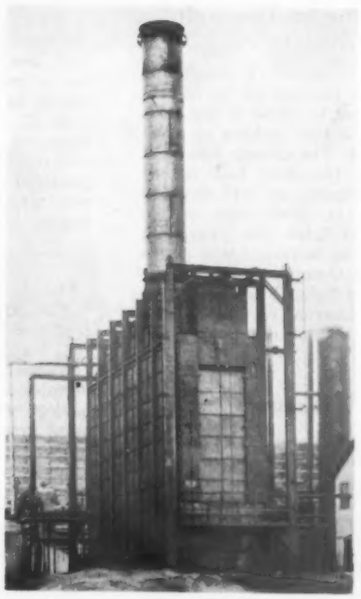
THE CASE HISTORY

Several years ago a heater, of the type shown, replaced older inefficient units processing crude oil.

	Heat Load	Efficiency	Release
OLD UNIT	60M²	52%	115,000,000 BTU/hr
BORN HEATER . .	60M²	86%	70,000,000 BTU/hr
SAVINGS			45,000,000 BTU/hr

Based on fuel costs of 20 cents per million BTU, this represents a saving of over $78,000 a year.

This heater has already paid for itself and is now returning profits of over $78,000 per year.



Remember:
THE FINEST HEATERS ARE NOT MADE . . .
THEY'RE BORN!

BORN *Engineering Company*

ENGINEERS and CONTRACTORS

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Representatives: LOS ANGELES, CALIF., G. R. Nance & Co. — SHREVEPORT, LA., Bass Sales & Equipment Co. HOUSTON, TEXAS, Sales Engineering Co. of Houston, Inc. — NEW YORK, N. Y., Richard Morton

Canadian Associates: BRANDON, MANITOBA, Canadian Brown-Steel Tank Co., Ltd.

Venezuelan Production

Average production in the last week of July was 1,531,168 barrels per day, and indications were that it would go even higher.

In spite of production losses occasioned by voluntary cutting back in the early months of 1950 when foreign oil was threatened with curtailment by legislation, Venezuelan daily average production for the first six months of 1950 was 1,406,503 barrels, the highest figure recorded for any six-month period, though only slightly better than the 1,405,019 of the last half of 1949.

G. A. Harvey Fractionating Column

Giant Column Moves Through London Streets

An unusual spectacle in London's streets on Sunday, July 23, was the passage of an 84-foot fractionating column hauled by three 20-ton tractors on a 32-wheel double bogey, making an overall length of over 160 feet. The column was built by G. A. Harvey & Co. (London) Ltd. to the order of The Lummus Company and was destined for Shell's new refinery at Shellhaven on the Thames which is to open later this year. On account of the length of the calvacade, the police insisted that it be moved through the city on a Sunday when the traffic is light. The entire trip from Greenwich to Shellhaven occupied three days, moving at the rate of four miles per hour.

Drilling In Venezuela

With 70 rigs drilling new hole in Venezuela, there were 51 completions during July. Mene Grande Oil Company scored the only new-field discovery with Tagua-1, owned jointly with Creole. Meneg also discovered eight new pools and made eight reservoir extensions in the nine other wells completed in July.

Creole's new-field test, East Maron-1, 10 miles southwest of Santa Barbara production, was rigging up as August began. Alturitas-1, 17,039 feet deep, was still testing in the southwest Lake Maracaibo area.

Socony continued successful exploratory drilling in the new and important Chimire field of eastern Venezuela but abandoned Silvan-2 in Barinas and suspended drilling in that area. Socony has been the only operators there since Meneg abandoned its third Apure wildcat and renounced considerable acreage in 1949.

Texas Company's Mata-1, several miles north from Meneg's Nipa field, was stuck on bottom at 11,439 feet as August began. Texas' only other rig was operating on development acreage in the Mara district of western Venezuela, while Texas and the associated Mercedes Company were operating five strings in Guarico, three in Mercedes, one in Palacio and one in Guavinita.

Richmond Exploration Company completely suspended drilling operations when its deep Cretaceous test, Zulia 1C-1, failed. Atlantic's Guasare-1 was testing the Cretaceous at 14,460 feet, while British Controlled Oilfield's EM-285 was drilling ahead below 12,000 feet. EM-285 is of considerable interest as the first test of the Cretaceous in a very large area on the east side of Lake Maracaibo.

Shell's CQ-1, five miles north from the Andean village of Valera and many times that many miles from any production, was just under 3,000 feet as August began, having been spudded in September, 1949. This hole has rarely been able to maintain circulation for long at a time. Shell's deep Pueblo Viejo test, LB-273, was testing at 14,746 feet. This hole also holds a record for longevity. It was spudded in 1947 and is over three years old. The last 1,100 feet in this hole were made with drillpipe of the extraordinary size of 2⅞ inches, and with a specially designed two-inch diamond core barrel which averaged about 23 feet per trip.

Shell's Mara wildcats DMM-1 and DPE-1 were drilling at 9,000 and 6,500 feet respectively. Newfield test West Terra WT-8, near the Colombian Tibu field, was shut down for most of May and June because of high water but was nearing 6,000 feet in early August.

The Atlantic-Shell test Guama-1, eight miles north of the Tucupido-Taman field, was suspended temporarily at 7,862 feet because of flood and fire. Atlantic's deep Ruiz test, Ruiz-3-33, gave mechanical trouble and had to be sidetracked and completed at a normal depth for that field of about 4,500 feet, but Ruiz 3-46 was scheduled for early drilling as an 8,000-foot test.

Mene Grande spudded new-field wildcat Cerro Pelado-1, five miles from La Ceiba production, and Sinclair spudded Guere-1, their first hole since Santa Barbara-133 was suspended in March, at a location about four miles west from Meneg's new-field discovery of May, Los Mangos-1.

W. L. Forster Resigns

W. L. Forster, general manager for the Shell interests in Venezuela for the last three and a half years and connected with the Shell Group for a quarter century in various parts of the world, has resigned effective Oct. 31.

R. C. McCurdy, a Californian who has been manager of the western (Maracaibo) division, will replace Mr. Forster. W. Starrenburg becomes manager at Maracaibo, and W. D. Kemball-Cook will return from Maracaibo to be an assistant general manager.

Third Line Authorized

The Ministry of Mines of Colombia has authorized construction of a 73-mile products line from the Pacific port of Buenventura to Cali. The Departmental government of El Valle granted permission to build the line. This is the third project which has been turned over to department governments.

The Cundinamarca government already has let a contract to Williams Brothers to lay a 125-mile products line connecting the upper Magdalena valley port of Pto. Salgar with Bogota. Line surveys are being made. A second line will be laid by the Caldas government from a point across the river from Pto. Salgar to Manizales.

A fourth project for which financing now is being arranged will be the extension of Tropical Oil Company's present line to Barranca. The 60-mile Tropical line will revert to the Colombian government in August 1951, when the DeMares concession expires. The four lines, when complete, will greatly simplify distribution of products in Colombia where difficult terrain makes movement of products by rail or road slow and costly.

Castellated Construction Brochure

Appleby-Frodingham Steel Co., Scunthorpe, Lincs., has prepared a 50-page brochure titled "Castellated Construction" giving detailed data on relative strengths of castellated beams as compared with standard joist sections. The Castellated system is a patented method of beam construction which saves steel. It is especially useful in the construction of long, low buildings. Copies of the brochure may be obtained from the construction department of Appleby-Frodingham Steel Co., from the United Steel Companies, Ltd., at 17 Westbourne Road, Sheffield, 10, or any district sales office of United Steel.

Shell Chemical Movies

The Royal Empire Society recently was invited by Shell Chemicals Ltd. to view a group of three color movies depicting the life cycles of the sinter moth, the red spider and the raspberry beetle. The guests were welcomed by F. A. C. Guepin, a director of the Royal Dutch Shell Group of companies. The three films are the first of a series planned by Shell to aid agriculture and horticulture in combating insect pests and plant diseases.

The films were shot on 16 mm. Kodachrome and blown up by Technicolor to 35 mm. Copies of 16 mm. and 35 mm. can be obtained on free loan as they are released, on application to Shell Chemicals Ltd., 112 Strand, W.C.2, or from the Petroleum Films Bureau, 29 New Bond Street, W.1. Enquiries about overseas distribution should be made to the Publicity Department, Shell Petroleum Co. Ltd., St. Helen's Court, London, E.C. 3.

Renaming Tankers

Anglo-American Oil Co. Ltd. is renaming its tankers after English, Scottish and Irish cities. First of the ships to be renamed was the 17,000-ton "Robert F. Hand" which became the "Esso Newcastle." The tanker has been engaged for the past 17 years in carrying oil from the Middle East to British and Continental ports. She was in the Atlantic convoy run during the late war.

Debutanizer Tower Arrives

A 135-ton debutanizer tower for the new Esso refinery at Fawley, England, which reached Southampton docks recently, presented a difficult problem of transportation. It was hauled to the refinery site 15 miles from the docks on a 32-wheel bogey trailer drawn by three heavy-duty tractors.

Left to right: Pres. Aleman, Sen. Bermudez

Pemex Dedicates Refinery

Speaking in connection with the formal dedication of Mexico's newest refinery, located at Salamanca, State of Guanajuato, on July 30, 1950, Senator Antonio J. Bermudez, director general of Petroleos Mexicanos, hailed the event as making a great step forward in the development of the Mexican oil industry. He pointed out that the refinery and the 270-mile pipeline which supplies it with crude from the Poza Rica field represent an investment of $37 million, all of which has been provided by Mexico's oil administration without outside aid, foreign or domestic. The refinery, begun in 1948, was designed and constructed by the engineering firm of Arthur G. McKee & Co. of Cleveland, Ohio, working in conjunction with Pemex engineers. Illustration shows, left to right, President Miguel Aleman and Senator Antonio Bermudez. An article by Ing. Ortiz Mena of Pemex, descriptive of the plant and of the economic program of which it forms part, appears on other pages of this issue.

MOBILE FOAM UNITS

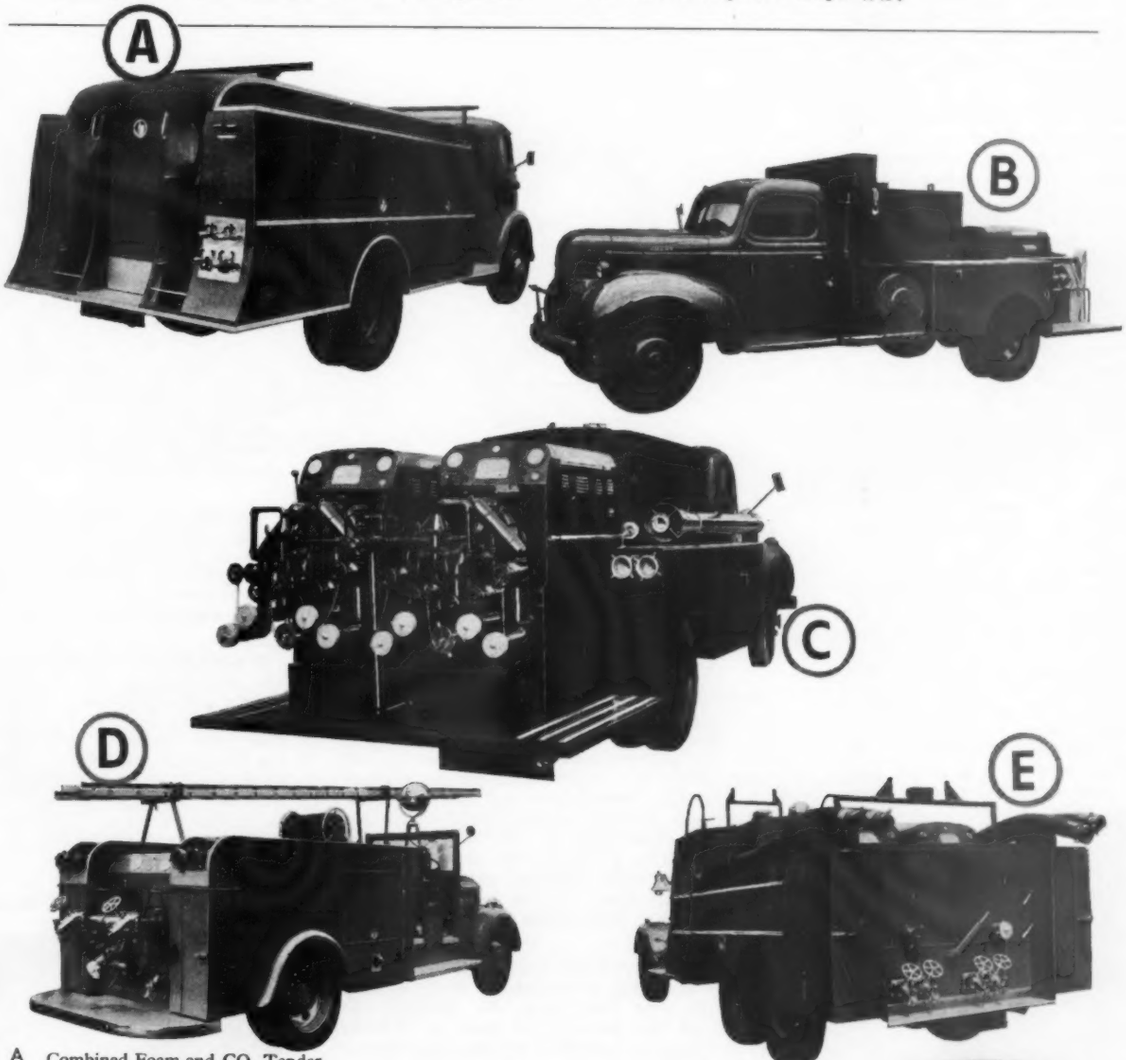
FOR FIGHTING OIL FIRES

Fast moving, up-to-date, motor driven Fire Tenders provide the highly efficient fire protection so necessary where oil or spirit is stored in bulk. "PYRENE" Tenders are designed to comply with the special requirements of oil storage installations and refineries. Typical examples of recent productions are shown here, these Tenders being fitted either with "PYRENE" Mechanical Foam Generators or Foam-making Branchpipes, Foam Compound Tank, independent fire pump (or pumps) together with Foam Hoses, Nozzles and other equipment.

"PYRENE" CO_2 Fire Fighting Equipment is also embodied in the vehicles if desired.

"PYRENE" Foam Tenders can be operated in conjunction with fixed pipeline installations, or for direct application.

Full particulars of this range of equipment will be forwarded on request to Dept. W.P.



A Combined Foam and CO_2 Tender.

B Foam and CO_2 Tender with self-contained pump unit and 2 Mechanical Foam Generators.

C Foam Tender with 2 self-contained pump units and Foam-making Branchpipes.

D Foam Tender with 2 Mechanical Foam Generators and pump driven by power take-off.

E Foam and CO_2 Tender with 4 Mechanical Foam Generators and 2 interconnected self-contained pump units.

Pyrene TRADE MARK FIRE APPLIANCES

THE PYRENE COMPANY LIMITED · 9 GROSVENOR GARDENS · LONDON, S.W.1 ENGLAND

Associated with the Pyrene Manufacturing Company of America.

Oil company staff changes

J. L. LAWRENCE has been appointed chief engineer at the Paulsboro, N. J., refinery of Socony-Vacuum Oil Co. He was assistant chief engineer prior to the recent retirement of E. H. Atwood. Mr. Atwood started at the refinery in Olean, N. Y., after graduation from Cornell University 38 years ago as the first engineer employed by the Vacuum Oil Co. He is co-inventor of a process for fractionating liquids which was the forerunner of modern refinery heat exchangers. He was in Europe for Socony-Vacuum between 1929 and 1940 and directed construction of the Port Jerome (now Notre Dame de Gravenchon) refinery in France.

ROSCOE E. SHUTT has opened offices in Tulsa as a consulting geologist and oil operator. Mr. Shutt has been vice president in charge of exploration for Barnsdall Oil Co. during the past five and one-half years. Before joining Barnsdall, he was for many years exploration manager for Shell Oil Co. in the mid-continent area. In addition to conducting his private practice and business, Mr. Shutt will be retained as a geological consultant for Sunray Oil Corp. which recently acquired Barnsdall.

D. W. SIMS has been appointed manager of Continental Oil Company's motor transportation division. He succeeds W. K. Kygar, who was recently elected president of Continental Pipe Line Co. John Kelly, formerly motor transportation engineer, had been promoted to assistant manager. Mr. Sims, who has been with Continental for more than 20 years, was formerly assistant manager of the company's pipeline department.

LEE N. HAUGEN has been appointed manager of the refining division of Cities Service Oil Co. (Del.) to succeed H. W. Camp, who retired Sept. 1. Mr. Haugen, who has been general superintendent since 1947, has been employed by Cities Service 27 years. During this period his work has been devoted entirely to refinery operations. Following his graduation from Iowa State College with a degree in chemical engineering, Mr. Haugen joined Cities Service as a junior engineer in 1923. He was appointed superintendent of the Ponca City, Okla., refinery in 1933 and manager of the East Chicago, Ind., refinery in 1942.

Lee N. Haugen

G. G. OBERFELL, vice president of research and development for Phillips Petroleum Co., retired July 31 after nearly 26 years of service with the company. During World War I, Mr. Oberfell served as a captain in the Chemical Warfare Service. After the war he joined the Chestnut and Smith Corp. at Tulsa, Okla., as research engineer and later was consulting natural gasoline engineer until he joined Phillips in 1925. His permanent residence will continue to be in Bartlesville, and on occasion he will act in a consulting capacity to Phillips research division.

Ross W. Thomas

ROSS W. THOMAS, manager of the research and development department of Phillips Petroleum Co., has been elected vice president of research and development and will supervise research and patent activities, as well as chemical manufacturing, development and sales. He succeeds George Oberfell, retired. He started in the engineering department in 1926 and for several years thereafter pioneered the development of markets for liquefied petroleum gases, with offices at Detroit. He took over his present duties at the headquarters office about ten years ago.

E. CLYDE McGRAW has been elected vice president in charge of operations of Transcontinental Gas Pipe Line Corp. Mr. McGraw has resigned as vice president of Stone & Webster Service Corp., as president of Montaup Electric Co., and as vice president of Tampa Electric Co. to assume his new duties with the Texas-to-New York natural gas carrier.

WILLIS W. HARDY, chief geophysicist since 1939 of the Socony-Vacuum Oil Co. Inc., has been appointed assistant chief of the company's exploration division.

WILLIAM J. HANNA, chief oil dispatcher of the Gulf Oil Corp., has retired Aug. 1, holding one of Gulf's two longest service records. He is the only Gulf annuitant who has retired with more than 47 years of continuous service. Stanwood Howes has been transferred from the Mene Grande Oil Co. C.A., Venezuela, where he served as terminal superintendent, to succeed Mr. Hanna.

W. C. WHALEY has been elected a director and vice president of Sunray Oil Corp. in charge of the California division. He was a director and vice president of the former Barnsdall Oil Co., now merged with Sunray. The company's refining activities in Santa Maria will be under direct supervision of Floyd L. Martin, vice president and manager of the refining division.

Supervising personnel for Sunray's west coast operations have been announced by Mr. Whaley as follows: F. A. Fueller, manager, land department; J. S. Loofbourow Jr., manager, geological department; T. J. Casey, counsel; and R. A. Smith, attorney, legal department. H. L. Stine, Sunray assistant secretary, office manager; and G. W. Davis, chief accountant.

Production operations will be in charge of R. E. Foss, manager, with offices in Los Angeles. Field supervision has been announced as follows: O. A. Graybeal, reservoir engineer; T. J. Prehoda, drilling superintendent; D. L. Caldwell, drilling department engineer; F. W. Borden, production superintendent; T. H. Acres, engineer, gas and gasoline department, M. C. Welch, superintendent; mechanical department, E. B. Closson, superintendent.

DR. ARNOLD BELCHETZ of Larchmont, N. Y., formerly chief technologist for Shell Petroleum Corp. and later head of the new processes department of The M. W. Kellogg Co., is now practicing as a consultant to the petroleum and chemical industries.

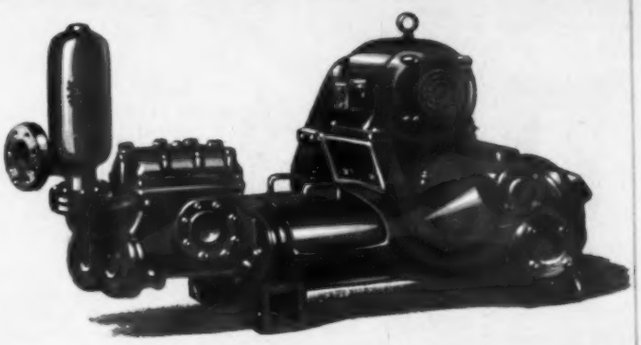
PATRICK M. CARMONDY, division field operating assistant in the New York metropolitan area of Socony-Vacuum Oil Co. Inc., has been made division operating manager of the company's Lubrite division, covering 10 midwestern states with headquarters in St. Louis.

MICHAEL H. NOLAN has been appointed general superintendent of Sinclair Refining Company's newly acquired refinery at Wood River, Ill., effective Aug. 1. Prior to joining the Sinclair organization in 1934, Mr. Nolan was with the Producers and Refiners Corp. at Tulsa, Okla., as assistant superintendent of the refinery there. He was appointed superintendent of the refinery at Sinclair, Wyo., in 1938, which position he held until transferred to Wood River.

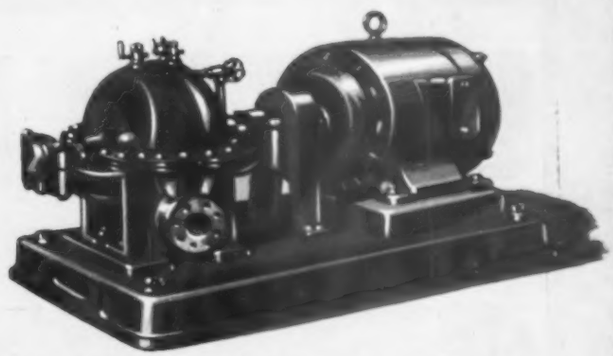
Michael H. Nolan

PUMPS

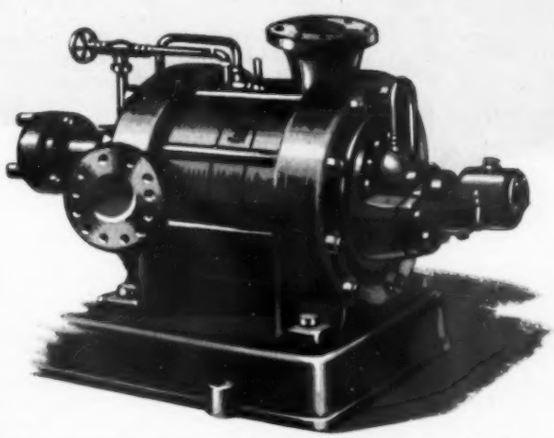
for the Oil Industry



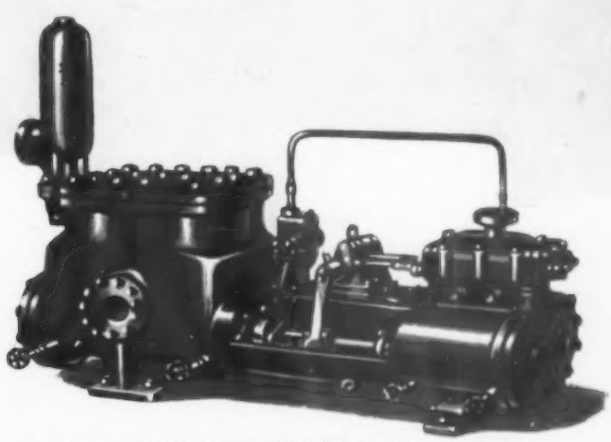
TOTALLY ENCLOSED DUPLEX PUMP for motor or engine drive by gearing, vee ropes or flat belts. A fabricated steel skid type base plate can be supplied if desired. The pump end can be fitted with liners, pistons, valves, etc., to suit any service requirement.



2 STAGE MEDIUM LIFT VOLUTE TYPE PUMP. Made in sizes from 2" to 6" delivery branch for heads up to 250 ft. Normally supplied with cast iron casing and bronze internal parts but special materials can be supplied if desired. For direct or belt drive.



MULTI-STAGE MOTOR DRIVEN PUMPS made in a range of sizes up to 6" diameter delivery branch, with from one to ten stages, suitable for heads up to 1000 ft. Cast iron casings and bronze internal parts. Can be supplied for higher pressures with cast steel casings.



A typical Evans **DUPLEX STEAM PUMP.** Built for extreme service. Can be fitted with removable liners of material to suit all requirements and valve service to suit varying liquids. Simplex steam pumps and steam jacketed pumps on similar lines are also made in a range of sizes.

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& SONS (WOLVERHAMPTON) LTD.

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Shell Installs Automatic Pumping Stations

Four pumping stations completely automatic in operation were put in service recently on the Shell Company's products pipeline which extends from the Wood River refinery at East St. Louis, Ill., to Columbus, Ohio. The inauguration of the new stations actually was directed from the dispatching office of the Shell Oil Company 850 miles away at its headquarters in New York. There the signaling of certain code numbers by D. B. Hudges, Shell's vice president in charge of transportation, on a telephone dial attached to a teletype machine set the pumps in motion, and later signals electrically transmitted brought back a teletype report of the suction and discharge pressures and electrical load of each station.

The stations which have been converted to full automatic control are at New Douglas, Effingham and Denison, Ill., and North Salem, Ind., along a stretch of a hundred miles on the eight-inch pipeline of the company. The purpose of the changeover is to increase both the operating efficiency and the capacity of the line which was built in 1938 to handle 16,000 barrels daily. It has since been enlarged by the installation of more powerful pumps. With this latest improvement it will put through 32,500 barrels per day.

The new equipment, which is said to be the first installation of its kind in the world, was evolved through the combined efforts of engineers of General Electric Co., American Telephone and Telegraph Co. and Bailey Meter Co., working with Shell's own technical experts.

In the operation of the system teletype relay equipment functions in conjunction with GE MI-9 switchgear as a part of the complete system of switchgear, control and accessory equipment furnished for the four automatic pumping stations. These relays permit the GE switchgear to set up a "station run" sequence at any one of the four new stations when the proper code letter is dialed in the dispatcher's office.

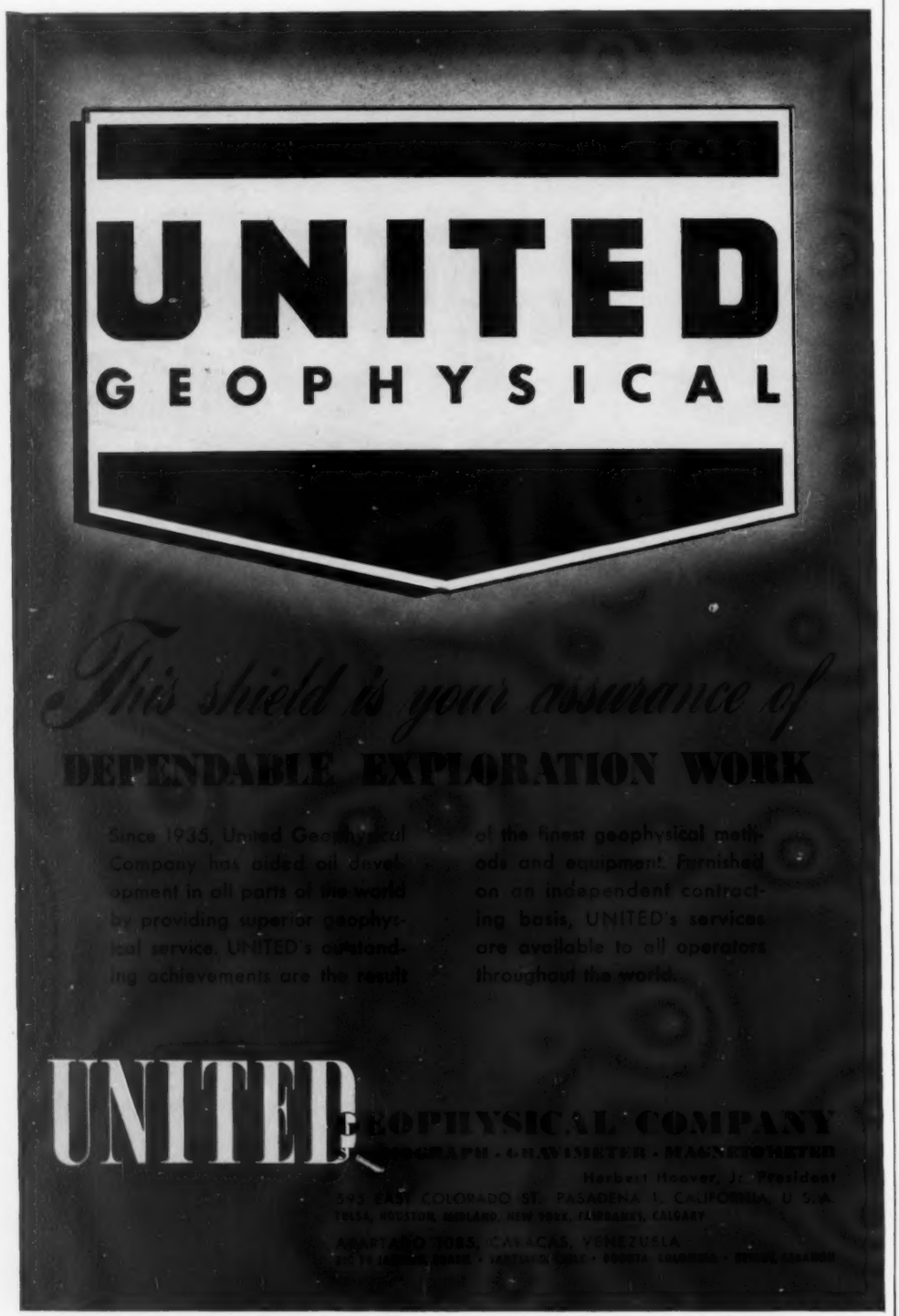
A 17-foot control board in Shell's New York office traces the progress of oil in the 450-mile products pipe line. Shell dispatchers set markers and adjust the charts to show exactly where each product is, 24 hours a day. As many as 22 separate products can be pumped through the line.

The "station run" sequency is in four steps: (1) starts an oil pressuring pump to lubricate seals in the main pump; (2) opens the motor-operated suction valve; (3) starts the 500-hp pump motor (full voltage start); and (4) opens the motor-operated main discharge valve to bring the station on the line. Shutdown is effected by opening the "station run" relay, which shuts off the pump motor and simultaneously closes the motor-operated valves. A mechanical check valve in the line permits pipeline flow to go past the pump when these valves are closed.

Dialing another code letter allows the dispatcher to read the instruments at any one of the four stations in rapid sequence over the teletype system. A Bailey pulse duration telemeter system in the MI-9 cubicle, in conjunction with pressure recording instruments both ahead of and behind the pump and a motor current recorder, causes the teletype to transmit letters which can be read by the dispatcher in terms of instrument readings.

To assure against equipment failure or fault in operation, each station is equipped with a complete complement of safety shutdown devices. In the event that any one of the safety devices trips, the station is shut down, and an annunciator registers the cause of the trouble. If any safety device is tripped, it locks out the station and makes it impossible to restart the station until an attendant is called and the trouble located. While the stations are completely automatic in operation, one man usually is located in each station to perform routine upkeep and to operate by hand any of the controls if necessary.

The four new booster stations are equipped with 500-hp motors and pumps. However, the stations are designed with pump bases and pump mounting arranged to permit future installation of 900-hp, wound-rotor, base-ventilated motors. This design was approved after a cost comparison study of three pipeline pumping systems showed favorable results under certain loadings for adjustable speed electric motor drive. The control, switchgear and instrumentation is also being arranged so that it can work with the 900-hp motors, since it is anticipated that within the next few years further increase in load on the east pipeline will justify installation of the larger motors and possibly the adjustable speed drive at these four new stations.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Since 1935, United Geophysical Company has aided oil development in all parts of the world by providing superior geophysical service. UNITED's outstanding achievements are the result of the finest geophysical methods and equipment. Furnished on an independent contracting basis, UNITED's services are available to all operators throughout the world.
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Pell W. Foster

Creates New Division

Foster Wheeler Corp. has appointed Pell W. Foster Jr. as vice president in charge of a newly-created equipment division. This division will comprise the steam, industrial, marine and condenser departments, which are existing commercial engineering groups serving the power generation, industrial processing and marine industries.

In making this announcement, Vice Admiral Earle W. Mills, U.S.N. (Ret), president and chairman of the board, stated that the new division would coordinate the activities of the present departments with the manufacturing and sales group.

Mr. Foster, a director and vice president in charge of production since 1946, will continue as active head of the production and procurement departments.

R. F. BAKER, vice president in charge of domestic producing operations, and A. C. Long, vice president in charge of foreign operations (eastern hemisphere), were elected directors of the Texas Co. on August 4.

J. S. Leach, vice president located in Houston, was elected executive vice president with headquarters in New York. He continues as a director. He is succeeded in Houston by G. R. Bryant, general manager of the refining department.

J. T. Wood, Jr., assistant to the president, was elected vice president in charge of foreign operations (western hemisphere). C. E. Olmsted has resigned as director and vice president because he is planning retirement Oct. 1.

J. S. Leach

G. SILVA, chief pilot for the Mene Grande Oil Co. C.A., in Venezuela, has been transferred to the Gulf Oil Corporation's Tulsa production division where he will continue to serve as a pilot. Mr. Silva joined Mene Grande in 1937 as an airplane mechanic. He served with the U. S. Naval Air Corps from 1943 through 1946, returning to Venezuela as chief pilot after terminating his naval service.

A. E. (SANDY) McKAY has been appointed executive vice president of Southern Geophysical Co. in Fort Worth. For the past six years he has been assistant chief geophysicist for the Atlantic Refining Co. at Dallas. Mr. McKay joined Indian Territory Illuminating Oil Co. of Bartlesville, Okla., in 1928, and he served this company until 1937 when he joined Atlantic.

H. W. CAMP, manager of the refining division of Cities Service Oil Co. (Del.), retired Sept. 1 after 33 years with the company. Mr. Camp, who is also a director, started with the company in 1917, when Cities Service was acquiring a number of refineries to take care of the oil from its newly discovered El Dorado, Kan., field. He has consented to be available on an advisory basis due to war conditions.

J. B. Taylor, Jr.

Ethyl Promotes Taylor

John B. Taylor Jr. has been appointed assistant director of research at the Ethyl Corp. laboratories in Detroit, Mich., to direct research on automotive and aviation products. Mr. Taylor joined Ethyl 19 years ago as a field engineer in Baltimore, Md. During the war years he served as coordinator and assistant director of engineering research, and for the past three years has been executive engineer of the research laboratories.

NIAA Elects National Officers

At the annual election of the National Industrial Advertisers' Association held in connection with its meeting in Los Angeles, the following officers were elected: Bennett S. Chapple, United States Steel Corp., president; Edward B. Beauchamp, Los Angeles, H. James Christy, Rochester, N. Y., Robert A. Joyce, Youngstown, Ohio, and James Totten, Toronto, Canada, vice presidents; Charles W. Shugert, Shell Oil Co., New York, secretary treasurer. The selection of Mr. Beauchamp, who is advertising engineer for the Lane Wells Company, as a national vice president marks the first time recognition has been given to the manufacturers of oil industry equipment as an important segment of the advertising fraternity. Mr. Beauchamp was president of the Southern California section of the NIAA during the past year and was active in organizing the highly successful meeting at Los Angeles.

Merton Anunson

Heads FWD Export Sales

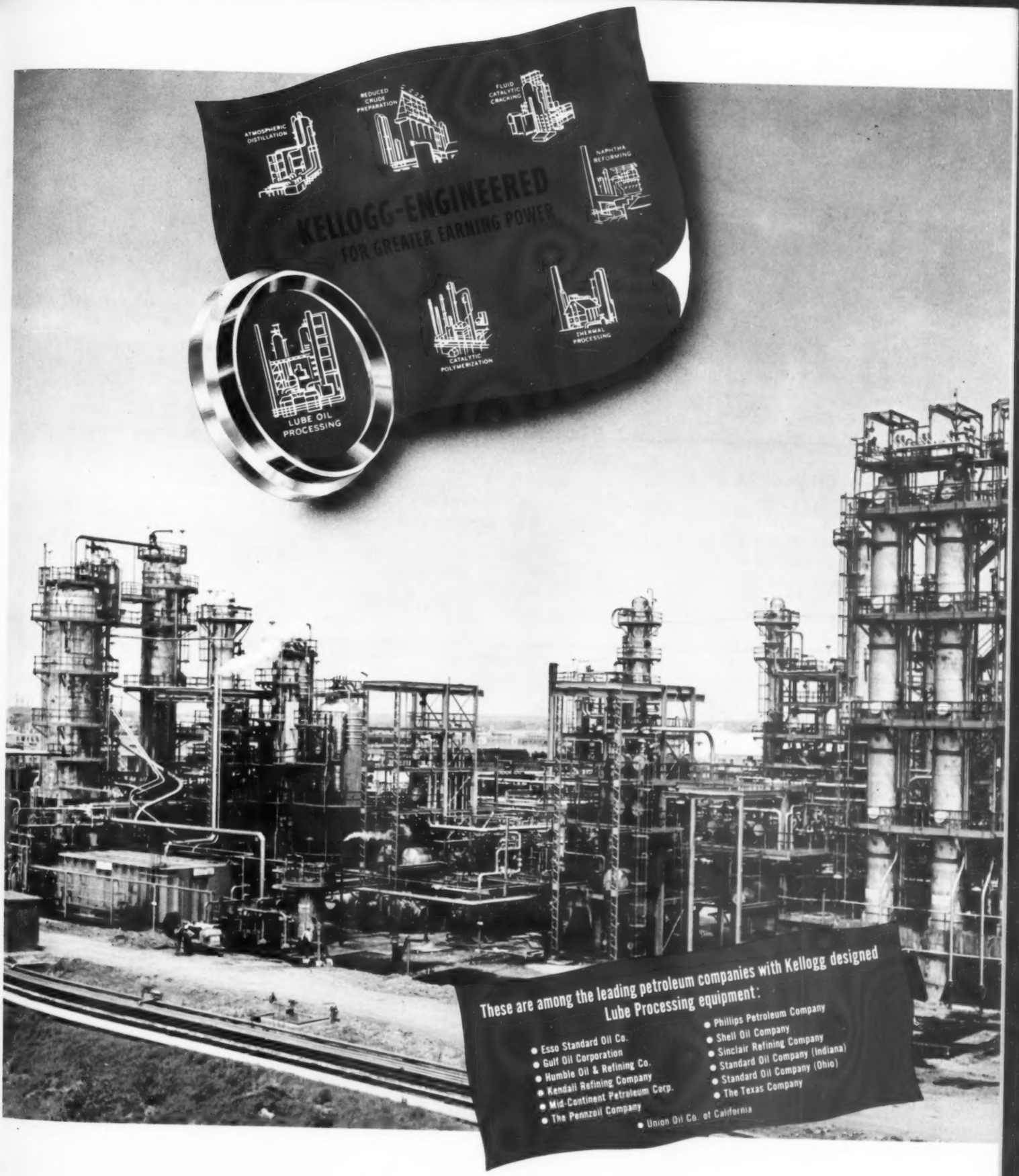
Merton Anunson has been appointed export sales manager for The Four Wheel Drive Auto Co. Mr. Anunson has been with FWD since 1935. He was in charge of FWD sales in Europe, Africa and the Near East until a year ago, when he was named administrative assistant to the director of sales.

W. L. KYGAR has been elected president of Continental Pipe Line Co., which has approximately 2,000 miles of pipelines and gathering systems in midcontinent and Rocky Mountain areas. He will make his headquarters in Ponca City. George W. Evans, Houston, manager of Continental's transportation and purchasing departments, has been elected chairman of the pipeline company. A. C. Wilkinson, Ponca City, will continue as vice president and manager.

Mr. Kygar, who has been associated with Continental for more than 25 years, was formerly assistant manager of the company's motor transportation division but spent many years in pipeline and production operations. He is the son of Dan Kygar, veteran pipeline official who was formerly with the old Marland Pipe Line Co. and the Kay County Gas Co.

R. M. "DICK" HANSEN, who has been works manager for Halliburton Oil Well Cementing Co.'s home office plants and shops at Duncan, has been promoted to the newly-created position of coordinator for Halliburton's engineering materials, manufacturing and transportation departments. Succeeding Mr. Hansen as works manager is Paul Scheefers, who had been his assistant.

Dick Hansen



Kellogg-designed lube facilities have a total charge capacity of more than 100,000 barrels per day!

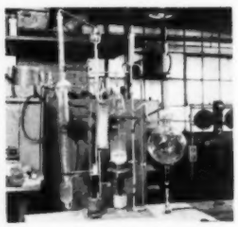
Yes! More than 35 million barrels of lube stocks are charged to Kellogg units each year!

FROM Pennsylvania's select crude to the Middle East's highly asphaltic stock, Kellogg's lubricating oil units are used to process virtually every type of feed. From single-unit propane deasphalters to entire lube plants, including everything from vacuum towers to barrelhouse facilities, Kellogg's experience is complete.

The pictured plant illustrates the unusual conversion of a surplus wartime alkylation-isomerization unit into a modern five-step plant for the production of high quality lubes. Today this plant is considered among the most modern and efficient in the world.

Kellogg offers refiners unduplicated experience in designing lube oil facilities, extending back over more than two decades, and now including the broadest choice of lube oil processes.

ENGINEERING HAS MARKED THE ADVANCES IN LUBE OIL REFINING!



Both lube oil specifications and lube refining economics have been subjected to extremely close scrutiny in recent years. Research by oil companies, pinpointing specifically desired product qualities, has set standards that design engineers have worked to match through improved equipment. Kellogg engineers have contributed much to this progress, bringing forth in a comparatively short space of time the Tower method of deasphalting, the water rejection principle for counter-current solvent extraction, propane fractionation, wax de-oiling and improvement in vacuum fractionating efficiency which enables refiners to make extremely narrow cuts at low cost.

IT TAKES ALL SEVEN TO PRODUCE GREATER EARNING POWER...

1 THE DEVELOPMENT "TOOLS"
—laboratories, pilot plants and recognized specialists to prove and improve processing and equipment ideas.

3 SPECIALISTS IN EVERY PHASE
of design engineering due to the completeness of Kellogg's engineering staff.

4 SPECIALIZED BUYERS
backed by the cumulative buying power of the largest company in the business.

5 COMPLETE FABRICATING FACILITIES
to make schedule deadlines and to develop workable "firsts" in refinery equipment.

6 CONSTRUCTION KNOW-HOW
acquired in completing hundreds of major jobs, plus an ample supply of the proper tools, and the constant development of new money-and-time-saving methods on the construction lot.

7 PRACTICAL OPERATING COUNSEL
on all design and construction, achieved through practical operating men working as an integral part of the company.

2. PROCESS ENGINEERING
by three distinct groups of specialists—the overall sequence planners, the specific process designers and the development engineers. The work of the first two groups is increasingly apparent in the new plants that continue to rise on the industrial landscape. The development engineer makes "headlines" with new processes, too, and Kellogg's development people have had their share. But many of their contributions to more economical processing go unheralded, although they are woven in to each new project —a new method of stripping here, a new method of introducing catalyst there, a double-function tower or furnace in another facility. Hidden as details of large over-all plans, these daily advances in refining efficiency are reflected over the years in improved earnings for refiners.

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BOOKS

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PRACTICAL ACCOUNTING FOR OIL PRODUCERS—Robert William Pritcher	$15.00
ALKYLATION OF ALKANES—Gustav Egloff & George Hulla	$20.00
CORROSION HANDBOOK—Herbert H. Uhlig	$12.00
CHEMISTRY OF PETROLEUM DERIVATIVES—Carleton Ellis	
Vol. I	$20.00
Vol. II	$22.50
CONVERSION OF PETROLEUM—A. N. Sachanen	$11.00
CHEMICAL REFINING OF PETROLEUM — V. Kalichevsky & Stagner	$ 7.00
CHEMICAL ENGINEERS' HANDBOOK—John H. Perry (revised 3rd edition, 1950)	$15.00
CORROSION (Causes and Preventions)—Frank N. Speller	$ 7.00
THE CHEMICAL PROCESS INDUSTRIES—R. N. Shreve	$ 8.00
CHEMICAL ENGINEERING ECONOMICS — C. Tyler	$ 4.00
CHEMICAL ENGINEERING PLANT DESIGN—F. Vilbrandt	$ 6.00
ELEMENTS OF FRACTIONAL DISTILLATION—Robinson & Gilliland (1950 revised edition)	$ 3.50
EMULSIONS & FOAMS—Berkman & Egloff	$10.00
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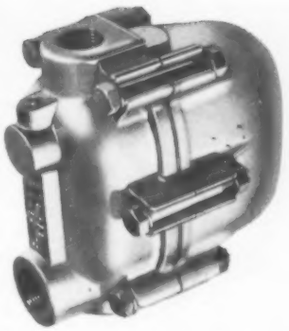
One of the unusual features of this FT-60 series of ball-float steam traps is that the case is a hot brass pressing (cadmium-plated bolts); one of the deepest and most difficult hot pressings ever made. But that is only a bit of the story.



Somewhat unusual in steam trapping

It may seem unusual to find a single firm making nearly 180 separate standard patterns of steam traps to meet the widest needs of industry.

Even more unusual, perhaps, to find that such a firm doesn't after all sell steam traps (like so much hardware) but good steam trapping methods.

And one might feel it is something quite off the beaten track to find that same firm concerning itself almost wholly and solely with methods of improving heat transfer from steam, of which good steam trapping methods are an essential part.

Thus the services to the oil industries from this single source include: (A) advice on any steam-heat transfer problem; (B) condensate drainage equipment (steam traps, pipeline strainers, sight glasses) for every requirement from vacuum up to 275 psi; (C) automatic air venting equipment for steam or water or oil lines and plant; (D) steam separators for *individual* steam drying at the inlets to steam units; (E) flash steam and condensate recovery equipment (including automatic pumping and lifting from vacuum and low pressure); (F) indicating steam metering equipment for departmental readings.

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SPIRAX HEAT TRANSFER

SPIRAX STEAM TRAPPING AND AIR VENTING

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DANBOLINE SILVERETTE

A special anti-corrosive paint which successfully protects exteriors of Rail and Road Tanks, Oil-field Plant etc.

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Dr. Sidon Harris

Southern Geophysical Moves to New Home

Dr. Sidon Harris, president of Southern Geophysical Company, announces that the company has moved from its former office in the Sinclair Building in Fort Worth, Texas, to a new building of its own in the suburban section of the city. The company also has established a branch office in Midland, Texas, to serve clients in the western part of the state and in New Mexico.

Since 1944 Southern Geophysical has grown from a staff of two to more than 200. It now has twelve seismograph survey crews actively at work.

Officials of the company, aside from Dr. Harris, are A. E. (Sandy) McKay, executive vice president; R. H. Dana, vice president and secretary; and four supervisors, R. E. Davis and Elmer F. Blake in charge of the Midland office, and W. D. Baird and J. G. Harrell at Fort Worth.

Gulf to Build World's Largest Cat Cracker

Contract for the construction of a 60,000-barrel-per-day fluid catalytic cracking unit was awarded by the Gulf Oil Corp. to The M. W. Kellogg Co. The plant will be erected at the company's refinery at Port Arthur, Texas, and the anticipated output will be approximately 20 percent greater than that of any similar installation currently in operation or under construction. It is scheduled for completion during the late summer or early fall of 1951. Cost of the addition, with auxiliary equipment necessary for its operation, will be approximately $8 million. It will be Gulf's eighth catalytic cracker.

Book Review

Motor Oils and Engine Lubrication, by Carl W. Georgi; published 1950 by Reinhold Publishing Corp., New York; 25 Chapters in 514 pages; $8.50.

The author has here provided a book that covers at least most of what is known about the use of lubricating oils for engines. He gives great attention to methods of testing of oils and to evaluation of their performances. Methods of refining lubricating oils and recovery of used oils are described. Separate chapters are devoted to lubricating diesel, airplane, stationary and marine engines. The publisher's claim that it is the first of its kind to assemble detailed information for ready reference on all aspects of motor oils seems to be justified.

Phillips to Operate Copolymer Plant

Phillips Chemical Co. will take over operation of the government-owned Copolymer synthetic rubber plant near Borger, Texas. The transfer to Phillips marks the first integrated manufacture of synthetic rubber through all stages from the production of raw materials to the finished product. Phillips already operates the adjoining Plains plant which now produces more than 50,000 tons of butadiene yearly. The company also manufactures furnace type carbon blacks adjacent to the butadiene and Copolymer plants. Philblack O, a high abrasion black produced from oil at a rate of more than 70 million pounds yearly, is a postwar development that imparts long wearing qualities to tire treads.

New Products Line

Susquehanna Pipe Line Co. is building an eight-inch, 125-mile petroleum products pipeline from Sun Oil Company's Toledo, Ohio, refinery to Sarnia, Ontario. The line is scheduled for completion and operation by about Dec. 1. It will deliver gasoline and furnace oils to Sun's River Rouge, Mich., terminal and carry liquefied gases to a Canadian chemical plant at Sarnia.

Graver Opens Cincinnati Office

Graver Tank & Mfg. Co. Inc. recently opened a district sales office in Cincinnati at 426 Transportation Building, to expedite services to its customers in that area. Sales offices are already established in Chicago, New York, Philadelphia, Detroit, Houston and Sand Springs, Okla. John R. O'Connor, formerly at company headquarters in East Chicago, is manager of the Cincinnati office. Mr. O'Connor joined Graver upon his release from the army as Lieutenant Colonel.

INVISIBLE ASSETS..

The skill and experience which goes into the making of every foot of rope made by British Ropes Limited —though not visible to the rope user—shows itself in other ways: strength, reliability, long wear; these qualities, so essential to the oil operator, are inherent in the products of British Ropes Limited.

WIRE ROPES: For Drilling, Casing, (Rotary and Cable Tool), Production, Refining and other needs.

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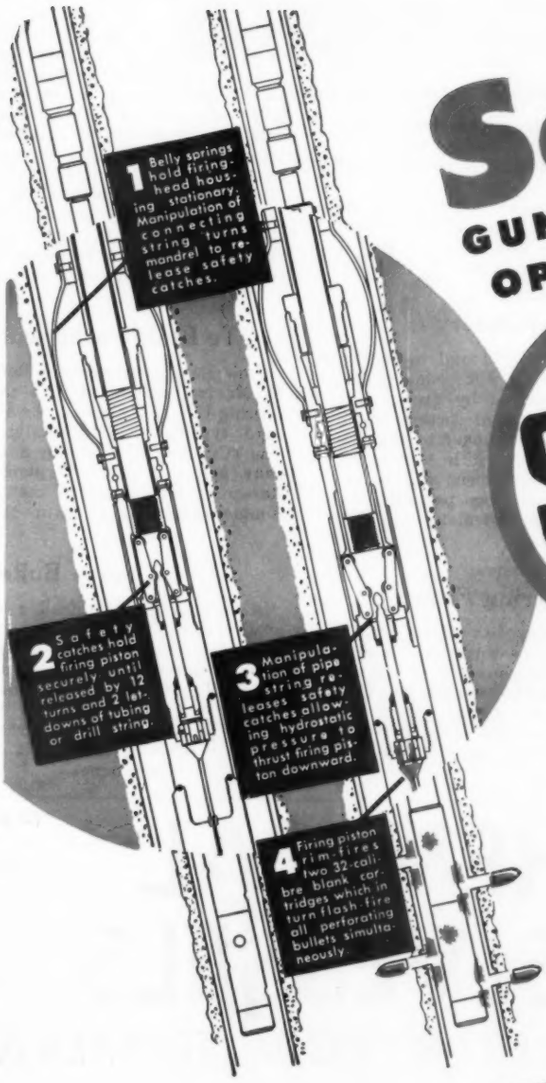
Sales Office: 52, High Holborn, London, W.C.1, England.
Telephone: Chancery 8822. Telegrams: Britrope, London.
New York: 18, South Street. Montreal: 13, St. James Street West.

Drilling crew showing driller and three rotary helpers—A Shell photograph

Safer GUN PERFORATING OPERATIONS with SHOOT-N-TEST


1 Belly springs hold firing-head housing stationary. Manipulation of connecting string turns mandrel to release safety catches.
2 Safety catches hold firing piston securely until released by 12 turns and 2 let-downs of tubing or drill string.
3 Manipulation of pipe string releases safety catches allowing hydrostatic pressure to thrust firing piston downward.
4 Firing piston rim-fires two 32-calibre blank cartridges which in turn flash-fire all perforating bullets simultaneously.

The "SHOOT-N-TEST" Gun Perforator Firing-Head ready to fire.

The "SHOOT-N-TEST" Gun Perforator at the moment of fire.

THE JOHNSTON ALL PURPOSE GUN PERFORATOR

THE JOHNSTON "SHOOT-N-TEST" Gun Perforator provides complete safety in every phase of gun perforating operations—maintenance, transportation to and from well, rig-floor handling and running in the well. The "SHOOT-N-TEST" fires *only* when subjected to *both* in-the-hole hydrostatic pressure and precise top-hole manipulation of the tubing or drill string by the driller.

Many advanced features are embodied in the Johnston "SHOOT-N-TEST" Gun Perforator to make it the ideal choice for operators desiring the utmost safety and efficiency in perforating and formation testing equipment . . .

POSITIVE FIRE of all bullets is assured by the flash-hole design of the perforating gun bodies.

EXACT POSITIONING in zone to be perforated is determined by actual pipe-in-the-hole tally.

SELECTED NUMBER OF PERFORATIONS is determined by the number of 4, 5 or 6-shot perforating gun body sections attached to the firing-head.

A MINIMUM OF EXPENDABLE PARTS for each perforating job. No extra equipment other than the "SHOOT-N-TEST" Firing-Head, the Perforating Gun Body Sections and a minimum of reloading supplies is needed.

FOR PERFORATING CASING AND TESTING FORMATION IN ONE RUN

By utilizing the Johnston "SHOOT-N-TEST" Gun Perforator with a regular Johnston Formation Tester Assembly, any designated formation can be perforated and tested in one round trip of tubing or drill string. A quick, efficient method of obtaining water shut-off information, doing exploratory work or testing for actual production.

SHOOT-N-TEST Trademark JOHNSTON FORMATION AND FIRING TESTING

M. O. JOHNSTON OIL FIELD EXPORT CORPORATION

EXPORT SALES

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International Tractor

Ship Pipeboom Tractors To Iraq

Delivery of the first ten of a fleet of 20 International Model TD-24 crawler tractors equipped with 20 and 22-foot Superior-Cardwell pipebooms to the New York docks for shipment to Iraq has been announced by R. P. Messenger, president of the International Harvester Export Co. The fleet will be employed in construction of a 556-mile large diameter pipeline from Kirkuk to Baniyas, Syria. The line is to be constructed by Arabian Bechtel Co., an affiliate of Bechtel International. Eight additional units will be shipped in September and the remaining two in December.

Specially engineered and designed for this specific pipe-laying job, a test model of the TD-24 with pipeboom was used recently on a Bechtel project, the "Super-Inch" line in California, to determine how this new tractor and boom combination would function under climatic and terrain conditions similar to those in Iraq and Syria. Surmounting numerous obstacles in the test, the new units were modified to include the following:

(1) Lifting capacity of the boom was increased from 78,000 to 90,000 pounds tipping load at four-foot overhang.

(2) Previous fixed boom counterweights were replaced with hydraulically controlled adjustable counterweights, hinged so as to get maximum counterweight effect and to enable the weights to be closer to the tractor when down.

(3) Special track rollers were provided to accommodate increased loadings resulting from greater lifting capacities. These rollers are equipped with increased bearing capacity and improved lubrication means, permitting the use of a desirable high speed of eight miles per hour. This speed is particularly useful, it has been found, when tractors are required for miscellaneous jobs several miles beyond the point where the pipe actually is being laid in the trench.

(4) Pipeboom transmissions were improved for increased loads.

When the units have served their purpose as pipeboom tractors, they can be converted for dirt-moving, road maintenance and similar types of work requiring dozers and scrapers.

To Rebuild Refinery

Sunray Oil Corp. will rebuild and modernize its 7,500-barrel Santa Maria, Calif., refinery, portions of which were destroyed by fire in late June. The natural gasoline plant section of the refinery was not appreciably damaged by the fire, but the topping plant along with the tanks, pumps and miscellaneous equipment will be rebuilt. The vis-breaker unit was partially destroyed, and it will be replaced along with the necessary auxiliary equipment.

Form Engineering Firm

Russell Engineering Corp., with offices at 2521 Wroxton Road, Houston, has been formed to specialize in the design and engineering of natural gas and petroleum processing equipment. Geo. F. Russell is the president. Other officers are Warren N. Richey, vice president and chief engineer, and James M. Hoover, executive vice president and secretary treasurer.

Anglo-American Managerial Appointments

R. J. Pinder has been appointed deputy general sales manager of Anglo-American Oil Co. He is succeeded by G. W. Powell, who since 1939 has been divisional manager of the southwestern division with headquarters at Bristol. Mr. Pinder joined the company at its Birmingham office 30 years ago. A year before the outbreak of war he was transferred to the International Association Petroleum Industry Ltd. as an executive assistant and was concerned with marketing problems in Holland, Belgium, Switzerland, Italy, Spain, Portugal and several other European countries. In 1945 he returned to Anglo-American where he assisted in the organization of the sales force following the ending of the Petroleum Board.

To Build Packaged TCC Unit

New Mexico Asphalt and Refining Co., Artesia, N. M., has contracted with Southwestern Engineering Co., Los Angeles, for a 6,000-barrel packaged type Thermofor catalytic cracking plant. The TCC unit is licensed by Socony-Vacuum Company and the Cat Poly plant by Hydrocarbon Research. It is expected that this plant will be completed in seven to ten months.

Grease Bulletin

A technical bulletin dealing with the properties of Ortholeum 300 as a stabilizer for grease in both non-catalyzed and catalyzed systems has been prepared by the Petroleum Chemicals Division of E. I. du Pont de Nemours & Co., Wilmington, Del. The product is designed to retard normal oxidation and to reduce the harmful catalytic effect of metals. It consists of a mixture of complex amines.

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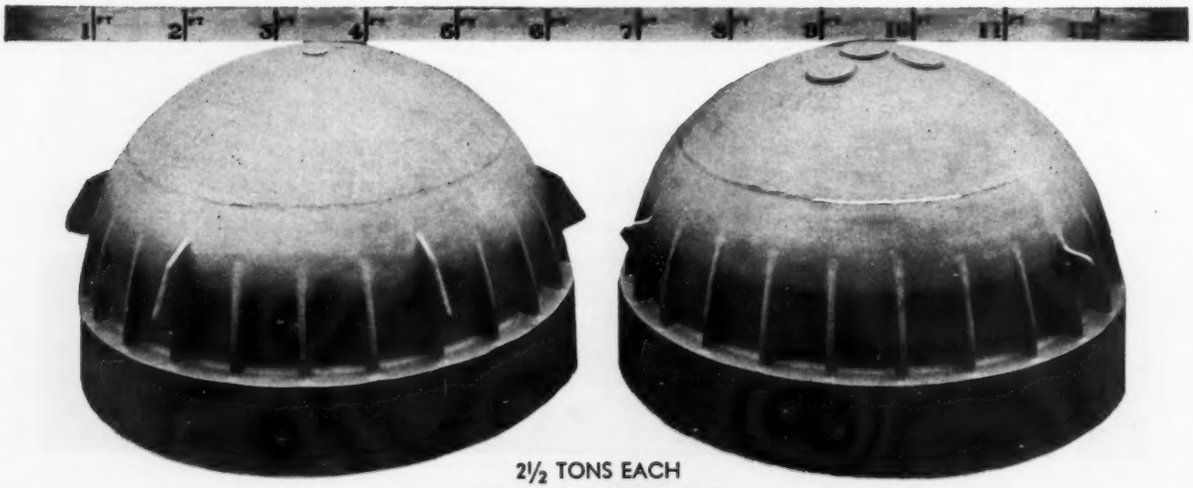

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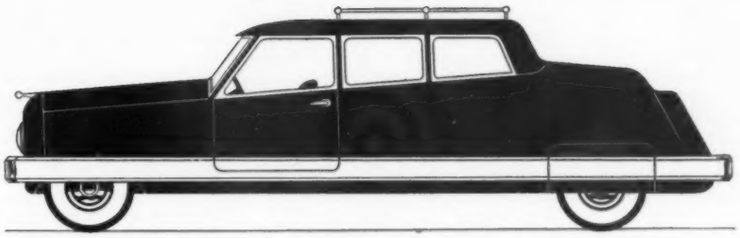

Advanced Rear Engine Touring Sedan by William B. Stout, Phoenix, Arizona

Found

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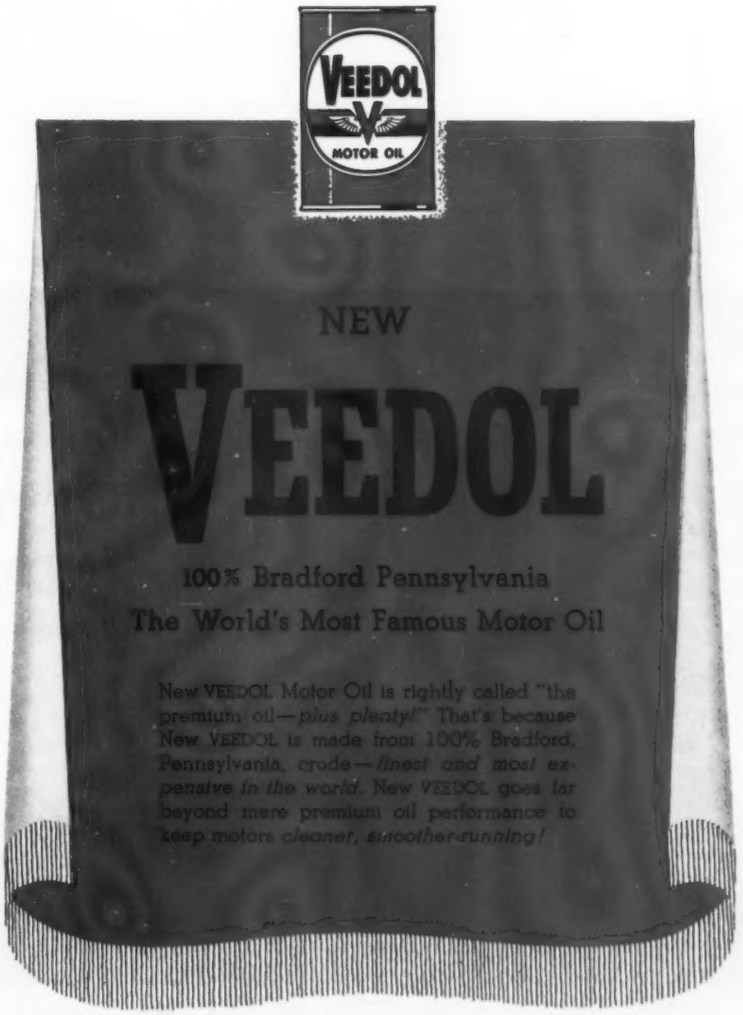
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Caltex Replies To Charges

W. H. Pinckard, chairman of California Texas Oil Co., has replied to recent Washington reports that Caltex overcharged on certain oil shipments to Nationalist China which were financed by the Economic Cooperation Administration. Mr. Pinckard stated that the charges were approved by the ECA China Mission after extensive discussions and were as low as the prices of competitive companies, or lower.

Caltex is now analyzing ECA claims for adjustments, and if any refunds are actually due ECA, they will be made, but the various factors in connection with prices of these old ECA shipments to China are so complicated that it will take some time to complete the analysis and enable it to establish the validity of ECA contentions. Some of the ECA claims were received as recently as the third of August.

ECA makes two basic charges. The first is that ECA regulations were violated because the price charged by Caltex was allegedly greater than the delivered price of oil from the West Coast of the United States. This presupposes that the West Coast of the United States was at that time the normal and available United States supply source for shipments to the Far East, which was not in fact the case.

ECA further asserts that Caltex charged on these shipments to China a higher price than that charged to other customers of Caltex. China was in no sense similarly situated to the other areas supplied by Caltex because of the serious civil war which was then in progress, but in any case, Caltex prices at that time were, it is believed, the lowest then being quoted by any company for shipments to China.

Mr. Pinckard emphasized that this matter dealt entirely with shipments to Nationalist China and that no shipments to Communist China had been made. Caltex has not sent a tanker into China in more than twelve months.

A large part of the ECA claim is based on its requirement for certain documents from China. The actual documents on these old shipments are still in China, which is now Communist occupied territory and consequently are not accessible, which is adding considerably to Caltex' difficulty in analyzing ECA claims.

New Ethyl Plant

New manufacturing plants to increase Ethyl Corporation's production of antiknock compounds will be built near Houston, Texas, President Edward L. Shea has announced. Construction will start immediately and will be completed by the end of 1951. Ethyl's last big expansion program was completed in 1949, increasing the capacity of the Baton Rouge plant by more than 30 percent. Additional facilities are now being installed there and will be in full operation by the end of this year.

Houston plans call for units to manufacture tetraethyl lead, sodium and chlorine, sodium-lead alloy and ethyl chloride. Other units will include lead recovery furnaces; laboratories; storage tanks for tetraethyl lead, ethyl chloride, chlorine and ethylene dibromide; a blender; and trackage for a fleet of tank cars for delivery of Ethyl fluid to customer oil companies in the southwestern and western sections of the country.

Compressor Station Contract

Arkansas Louisiana Gas Co. will erect a 4,200 hp compressor station at Blanchard, La. The plant will have a daily capacity of 65.4 million cubic feet when completed in December, 1950. Contractor is Delta Engineering Corp., Houston.

New Corrosion Project Officers

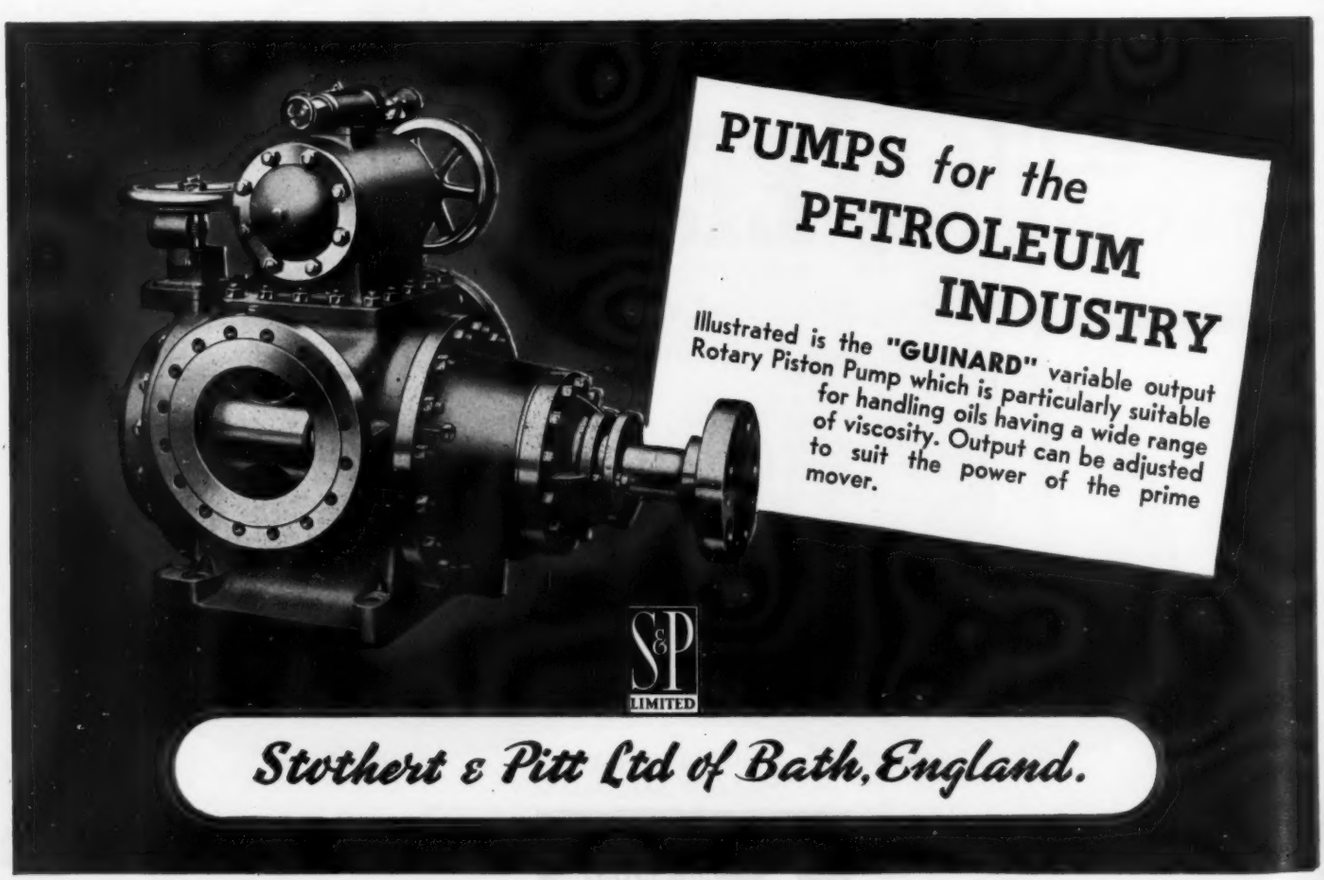
T. S. Zajac, corrosion engineer, Shell Oil Co., Houston, was elected chairman of the corrosion research project committee of the Natural Gasoline Association of America at the recent semi-annual meeting of that group in Fort Worth. He succeeds W. H. Stewart, Sun Oil Co., Beaumont, Texas, who has been chairman for the past two years. F. A. Prange, chief metallurgist, Phillips Petroleum Co., Bartlesville, Okla., was elected vice chairman of the committee.

Esso Defense Unit Called

The first of several defense service units, sponsored by Esso Standard Oil Co., has been alerted for mobilization. Composed of employees from the Pennsylvania division of the company, the unit is the 643rd Quartermaster Petroleum Depot Company, U. S. Army Reserve. It is one of a variety of groups made up of petroleum industry personnel trained to serve as petroleum specialists in the armed forces. Commanded by Capt. Norman J. Sickles, in civilian life a bulk stockloss investigator for Esso, the unit will be responsible for the operation of petroleum depots, tank farms and pipeline terminals supporting combat units.

Petrofina Enters Canada

Arrival in Alberta of technical representatives of Compagnie Financiere Belge des Petroles marks the first active participation of a continental European oil company in Canadian development. Petrofina has acquired leases in five Alberta fields and will operate through a Canadian affiliate, Canadian Fina Oil Ltd., which has been incorporated with a share capital of $3 million.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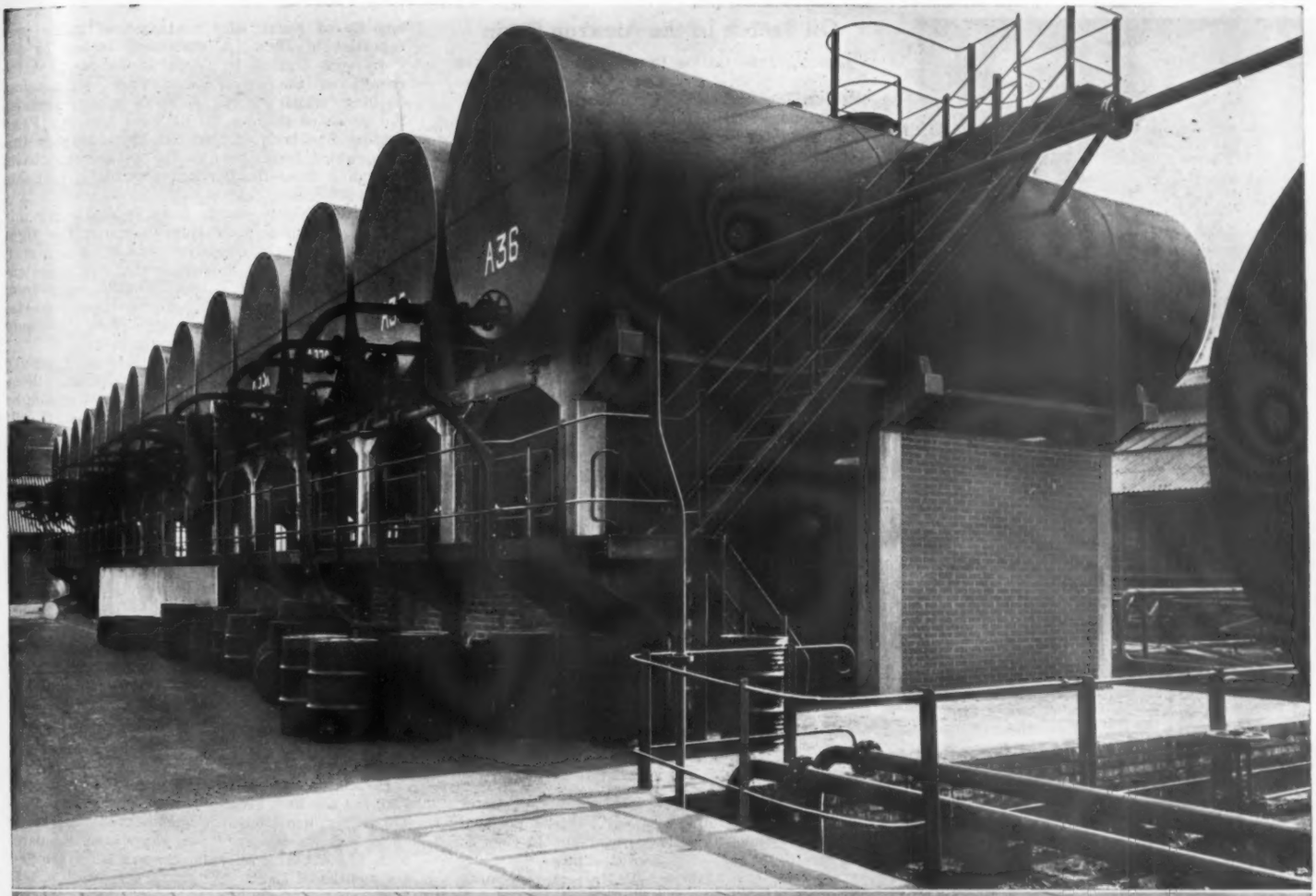

OXLEY

WELDED STORAGE TANKS

A close-up view of a battery of fourteen welded storage tanks each 9′0″ diameter by 30′0″ long with connecting platforms and access staircases. Erected and installed by Oxley at Ellesmere Port, Cheshire, England, for Lobitos Oilfields Ltd., who gave permission for this photograph to be taken.

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Gov. Turner narrating "Wheels of Oil" show.

"Wheels of Oil"

Governor Roy J. Turner of Oklahoma, shown at microphone in center of accompanying illustration, appeared Aug. 17 as guest narrator on the new radio series, "Wheels of Oil—the Story of an Industry," which is broadcast weekly from station KVOO at Tulsa. Shown at left is Ruth Sheldon Knowles, nationally known writer on oil subjects, author of the series, and at right is John Henry, narrator.

Buys Sohio Michigan Line

Mid-West Refineries Inc. has formed Michigan-Ohio Pipeline Corp., with offices in Grand Rapids, to purchase and operate the 250 miles of crude lines of the Michigan division of the Sohio Pipe Line Co. These lines extend from Toledo, Ohio, to Freeman and Buckeye, Michigan, in the oil field area of central Michigan.

L. A. Woodward, president of Mid-West Refineries Inc., is president of the new pipeline company, and C. A. Schrader, vice president and general manager.

Oil Search In the Amazon Basin

General João Carlos Barreto, president of the Brazilian National Petroleum Council, announces that drilling operations were started on July 18 on a pioneer well in Limoeiro, State of Para. The site is on the west bank of the mouth of the Tocantins River, north of Cametá and 72 miles southwest of Belem, capital of Para. Drilling is in charge of the Drilling & Exploration Co.

Prospecting for oil at the mouth of the Amazon was begun in the third quarter of 1946, in accordance with the plan drawn up by the consulting engineers, DeGolyer & MacNaughton. Geophysical prospecting by the seismic method was employed in order to determine the thickness of the sediments in Marajó Island and surroundings. These operations revealed a sedimentary layer, more than 3,000 meters thick, which extends from north to south through the island, then deflects eastwards, crossing the River Tocantins, and continues towards the Maranham Basin, traversing the rivers Moju, Acará and Capim.

Seismic exploration in charge of Geophysical Service Inc. was followed by gravimetric and magnetometric investigations by Exploration Surveys Inc. so as to locate the structures presenting the best conditions for the accumulation of oil. As a result in 1949 certain structures were determined, in particular a more ample anticlinal fold likely to accumulate oil in commercial quantities in the Limoeiro district. It was, therefore, decided to sink the first test well at this position in order to verify the possibilities of the mouth of the Amazon as an oil-producing area.

General Barreto points out that the site selected is the most favorable discovered to date in the sedimentary basin of Marajó, but that other drilling may be necessary, as the area in question is very extensive, embracing 23,000 square miles.

The Petroleum Council's activities have been intensified this year in the sedimentary zones of the lower and middle Amazon, where superficial geological studies will be carried out to confirm the results of geophysical prospecting.

The discovery of oil at Pedras, in the municipality of Entre Rios northeast of Bahia, was reported in June. A statement issued by the Petroleum Council in Bahia announces that the results of the investigations are encouraging. Drilling, which is still proceeding, has revealed the presence of free oil of good quality. Prospecting has been carried out since 1948 in this area, which forms part of the sedimentary basin extending from the Reconcavo oil fields in Bahia to the River San Francisco.

Drilling, which was to have started early this year near Carolina in Maranham, on the right bank of the Tocantins River, will not begin until October. The delay is due to the difficulties encountered in building the 200-mile road from Urucui, which, with the special plane service maintained by the Brazilian Air Force, is the only means of access to this isolated region.

Work on the National Petroleum Council's 2,500-barrel refinery at Mataripe, Bahia, will be completed in October, so that the plant should be in full operation by the end of the year. It will process crude from the Candeias and Itaparica fields at the start, and its capacity will be doubled as soon as the Reconcavo reserves permit.

New Valves

A new range of valves, designed by a leading consulting engineer specializing in oil field and oil refinery work, is being manufactured by Metaducts Ltd., Catherine Wheel House, Brentford, Middlesex, England. Sold under the trade name of Metastream, the valves meet the rigid requirements of British Standard 1414:1949. Head room required for the valve has been reduced to an absolute minimum.

Imperial Profits Up

Estimated net operating profits of Imperial Oil Ltd. for the first six months of 1950 are $10,975,499, after provision for income taxes. This is equivalent to 40 cents per share and compares with $8,667,178 or 32 cents per share for the first six months of 1949.

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Steam, Diesel or Motor-Driven Pumps, Reciprocal and Centrifugal types, for all refinery duties; Heat Exchangers; Air Compressors; and all power plant auxiliaries for Boiler Feeding and Feed Heating. Write for Catalogue Section IL.81 "Weir Pumps for the Oil Industry."

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FOR SHALLOW WELL DRILLING

Drill to 4,500 feet . . . service to 8,000 feet with the U-34. The unit can be powered with one or two engines having 140 to 275 H.P., and is available in single or double drum models. The U-34 is designed with the same care and precision of manufacture as Unit Rig's larger drawworks . . . in fact, the "big rig" features make possible stepped up speed of operation with unusual economies. Select a U-34 and make a profit on shallow well drilling jobs.

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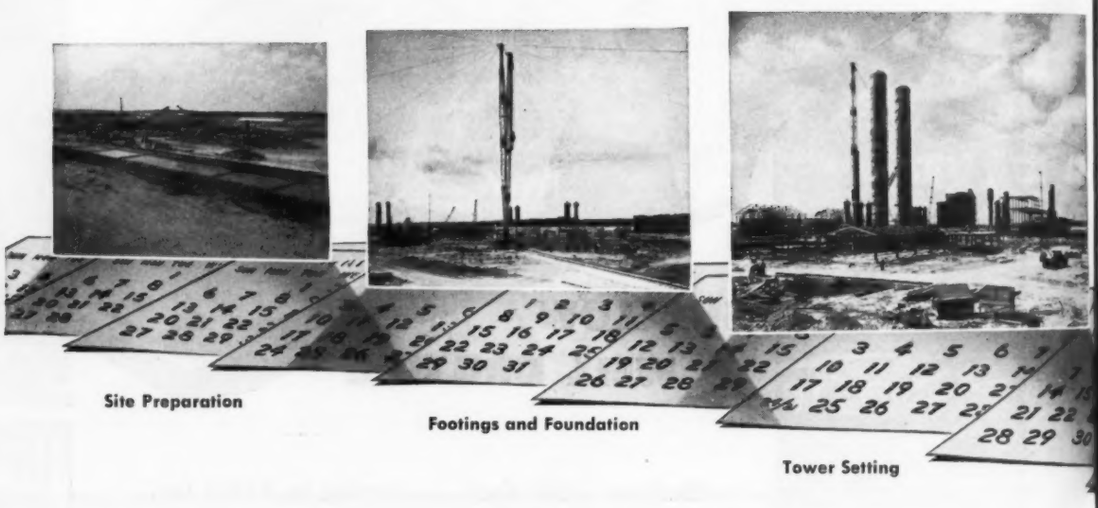

Site Preparation

Footings and Foundation

Tower Setting

Scheduled by Lummus means engineering and construction is a complete integration of planning, forecasting and cost control, applied with individual responsibility from start to finish. Lummus' complete scheduling of your refinery project smooths the work flow. There is no wasted effort. You can count on delivery of an economical, well functioning plant on or before the required completion date.

Scheduled by Lummus means plant engineering starts earlier than conventional work planning. It begins with original process design and job engineering. Because time is money, the project is engineered from the start with emphasis on time-economies in the entire erection operation. Erection methods are analyzed in advance from the standpoint of practical application at the site.

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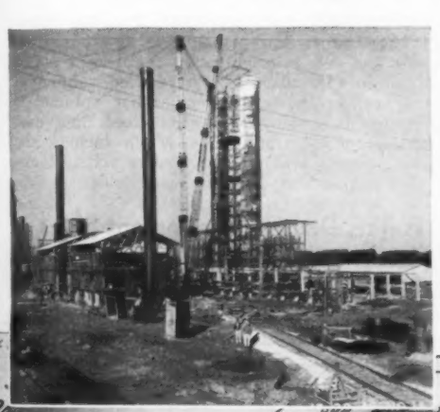
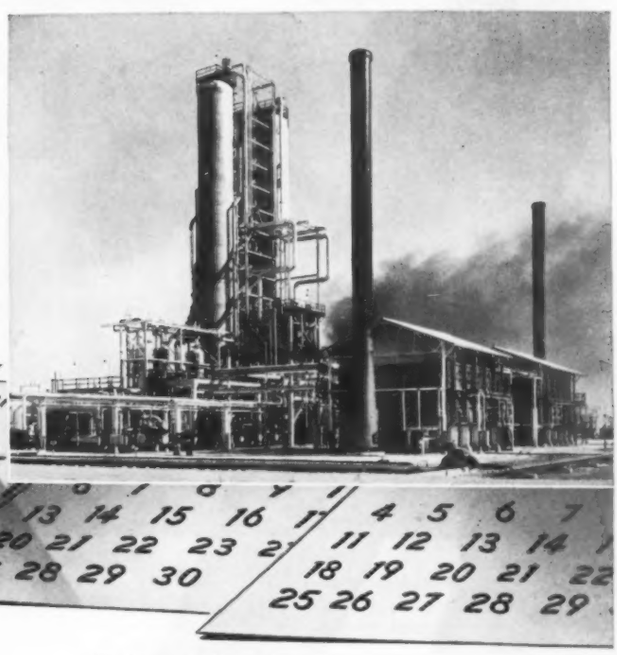


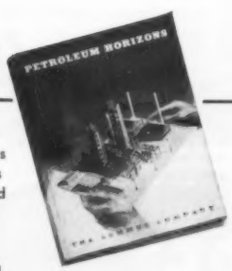
Tower Structure and Heater Erection



Start-up and Operation

Scheduled by Lummus means all materials are planned to arrive as needed. Just the construction tools and skills required for the immediate use of these materials are provided at each successive stage of the job. Costs are kept under day-to-day scrutiny and control. Problems of delivering, erecting and coordinating individual units into an operating whole are anticipated, with hundreds of previous records as a guide.

Lummus' wide range of experience is the key to this thorough and advanced method of procedure. One recent job went from letting of contracts to successful operation in eight months. Another complete foreign refinery was completed in fifteen months. Your next project, "scheduled by Lummus" can be the answer to realistic cost control and the economies that come with completion on or ahead of schedule.



PETROLEUM HORIZONS, the new 80-page book on Lummus processes and plants, features a step-by-step description and flow sheets for 31 refinery processes. It brings you complete details on the background, organization and world-wide services of the Lummus Company. Your copy available on request.

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Axelson Deep well Plunger Pumps are the result of 55 years' experience by the world's largest designer and manufacturer of Deep well petroleum pumping equipment.

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There is an Axelson plunger designed to give you positive performance — regardless of your well condition — ask Axelson for Practical answers!

Los Angeles Nomad Whing Ding

Annual golf tournament of the Los Angeles chapter of Nomads was held at the Lakewood Country Club in Long Beach July 14, with an attendance of 300. The golf tournament was organized and engineered by Joe Schlarb, Bill Wilson and George Gudenkunst. Winners, in the order named, were: Dick Regan, Waldo Williams, Joe Bergeron, J. H. Cooke, Bill Barbee, Dewey Mong and Andy Anderson. Dinner in the evening was followed by a stage show, provided by Walter Trask. Jerry Engstrand was general chairman.

Schlumberger Sales Manager

R. R. Rieke, former manager of the Gulf Coast area for Schlumberger Well Surveying Corp., has been appointed general sales manager, as announced by R. Henquet, executive vice president of the company. Mr. Rieke has been associated with the Schlumberger sales organization since his graduation from the University of Iowa in 1936.

Direct Flow Pumps

Aldrich Pump Co., Allentown, Pa., has introduced the direct flow principle in new pump designs. The new Aldrich pump features a major revision in construction with reduced volume of space between valves and a higher volumetric efficiency. It employs a sectionalized fluid end, composed of separate units which include the working barrel, stuffing boxes, valve units, plunger and suction and discharge manifolds.

Heads Drilling Equipment Sales

W. T. Cushing Jr. has been appointed manager of drilling equipment sales for The National Supply Co. Mr. Cushing joined National Supply in 1940. He spent several years in the engineering and sales departments and later became division sales manager of National's northwest and Canadian districts. He succeeds W. R. Ryburn who is now manager of seamless products sales for Spang-Chalfant.

New Core Lab Officers

Following the recent acquisition of controlling interest by a group of employees, Core Laboratories Inc., Dallas, has elected Ralph W. Parnell. Shreveport, and Ben A. Elmdahl, Houston, as directors. Other directors are John D. Wisenbaker, Dallas, president of the company, and two representatives of Case-Pomeroy, New York. The latter organization formerly held full ownership of Core Lab. Rufe S. Bynum, Midland, and J. W. Barbour Jr., Oklahoma City, were elected vice presidents, and Clair C. Miller, Dallas, secretary and treasurer.

New Sinclair Headquarters

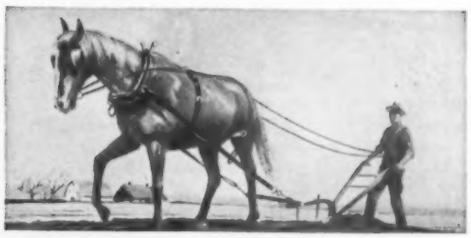
Sinclair Oil Corp. has leased more than half of the office space in the 26-story building now in course of construction at 600 Fifth Avenue, New York. The lease is for a period of 21 years from May 1, 1951. The building will be known as Sinclair Oil Building.

Gas Turbines

Large-scale production of gas turbines has been started by the General Electric Co. at Schenectady, N. Y. Accelerated production has begun on the first of more than 20 gas turbines scheduled to be built within the next two years for gas pipeline pumping stations and power generation. A newly designed 5,000 hp two-shaft mechanical-drive type turbine is to be built for gas pipeline pumping and other applications. The availability of gas or oil for fuel, the low water requirements, and the compactness of the gas turbine suit it for gas pipeline pumping.

JAMES TANHAM, vice president of The Texas Co. in charge of industrial and public relations, retired on August 31. Mr. Tanham joined the company after release from Naval service at the end of World War I. Before being elected vice president in 1941, he had been assistant to the president.

DOBBIN



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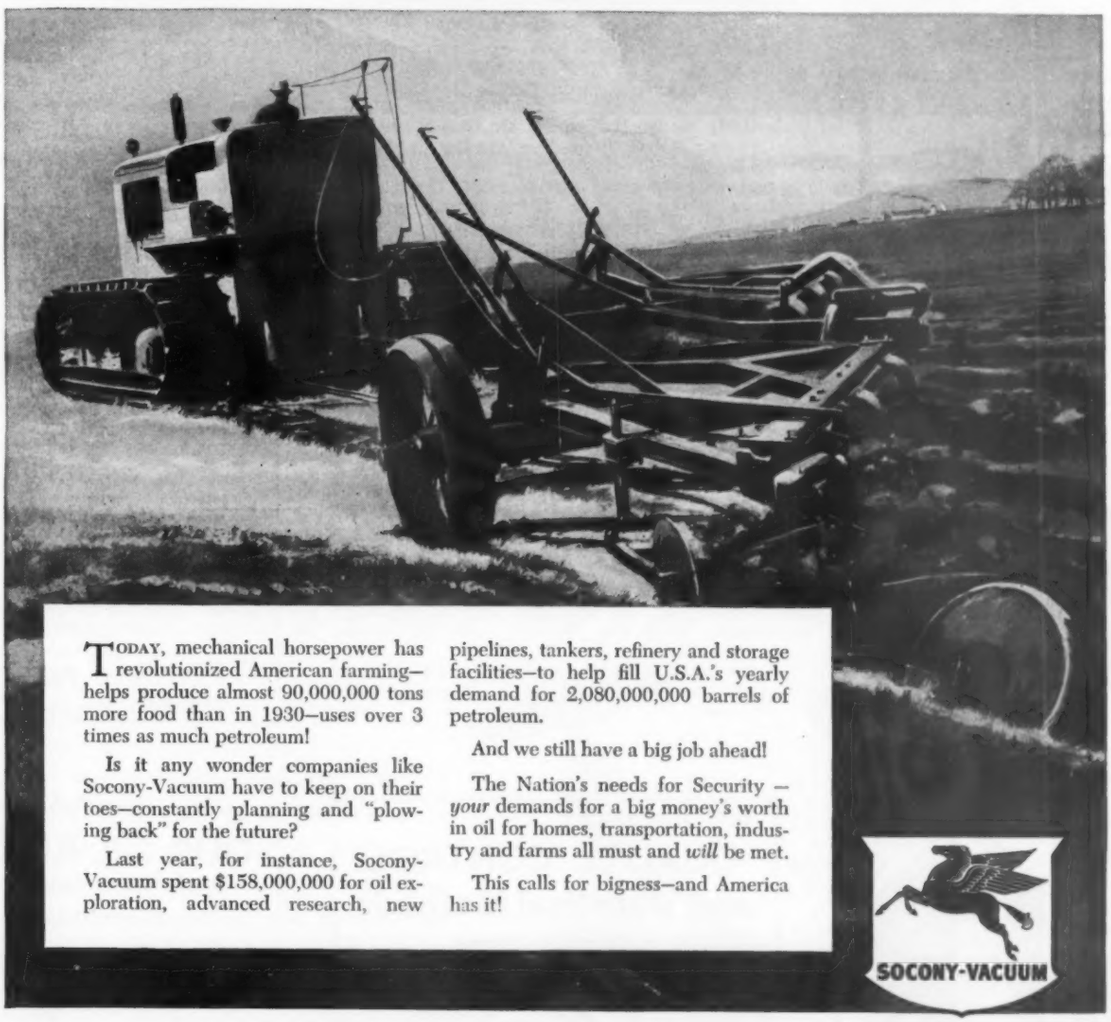

TODAY, mechanical horsepower has revolutionized American farming—helps produce almost 90,000,000 tons more food than in 1930—uses over 3 times as much petroleum!

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Petroleum Lubricants Aid Ship Launching

When the 10,450-ton motorship "Kieldrecht" was launched late in July from the Sunderland, England, yard of Messrs. Bartram and Sons Ltd., special petroleum lubricants instead of the tradition tallow or tallow compounds were used in sending her off the ways. The new lubricants, "Basekote" and "Slidekote," have been introduced by the Anglo-American Oil Co. Ltd.

"Basekote" is a wax-like compound which is applied hot to the wooden standing and sliding ways. It sets quickly to form a smooth, firm surface with low frictional characteristics and very high load-carrying properties. "Slidekote" is a specially prepared buttery grease-type product which is applied cold on top of the "Basekote," where it acts as a lubricant between the layers of "Basekote" on the fixed and sliding ways. It is claimed that these new launching lubricants offer many advantages over tallow, tallow compounds, whale oil, soft soap and other lubricants which have been used for many years.

Left to right: R. G. Kelly, P. C. Mayfield

Halliburton Promotion

R. G. Kelly, Halliburton Oil Well Cementing Company's west Texas-New Mexico division superintendent at Midland, has been named central region manager and transferred to Halliburton's home office at Duncan, Okla. He will supervise California, west Texas-New Mexico, central Texas, east Texas and north Louisiana divisions. He is succeeded by P. C. "Bill" Mayfield, former assistant superintendent. Mr. Kelly now fills the post vacated by L. B. Meaders, who became vice president in charge of field operations.

Erratum

The following corrections should be noted in the list of supertankers built and building in the United States which was published on Page 33 of the May, 1950, number of WORLD PETROLEUM:

Name	Owner	Deadweight Tons
Bulkpetrol	Oceanic Tankships, SA	30,011
Bulkoil	" "	30,006
Bulkoceanic	Universe Tankships Inc.	30,016
Bulkstar	" " "	30,013
Contract 28 (Bulk Trader)	" " "	30,004

Exact tonnage of these tankers was not available at the time the original list of supertankers was published.

New Type Servicing Hoist

A well-servicing hoist developed by Woodfield Hoist Co. of Rochester, Kent, England, was demonstrated recently at Lensbury Club, Teddington, before the export division of Shell Oil Co. The hoist, with its mast, weighs 25 tons and is truck-mounted for mobility. An accompanying unit is a 4,000-pound truck-mounted crane. Both units were built on order for Shell and are intended for overseas use.

New Oil Film

A new documentary motion picture which depicts the round-the-clock role of oil in the modern world has been completed by the Oil Industry Information Committee of the American Petroleum Institute. Entitled "24 Hours of Progress," it is now available for industry field sampling and for distribution. It will be released for public showing beginning Sept. 10. The picture was prepared primarily to help the public reach a better understanding of the men and women of oil and the work they do to assure the social and economic progress of the American people.

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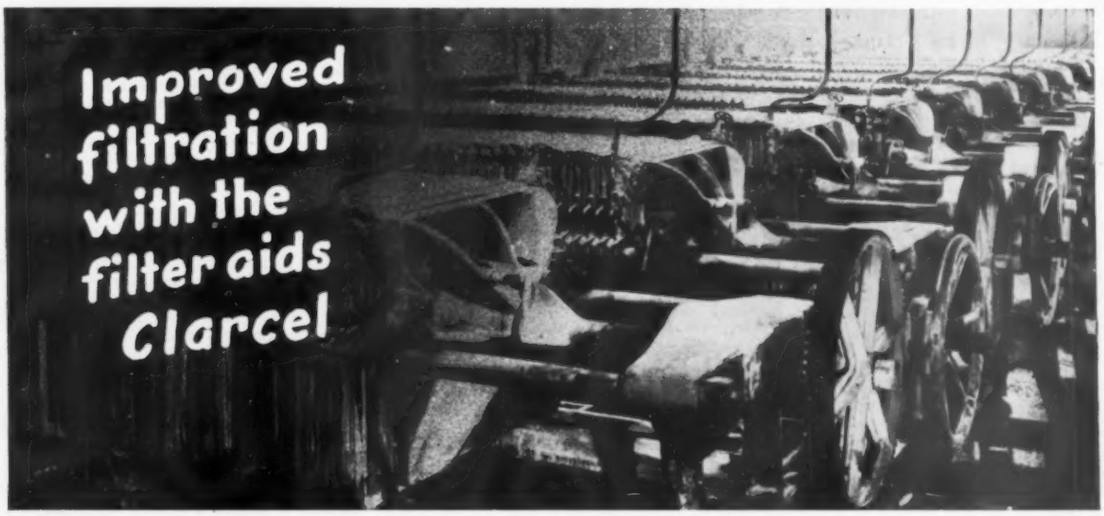

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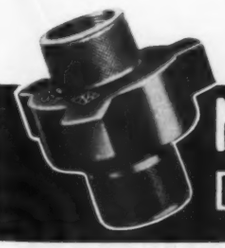

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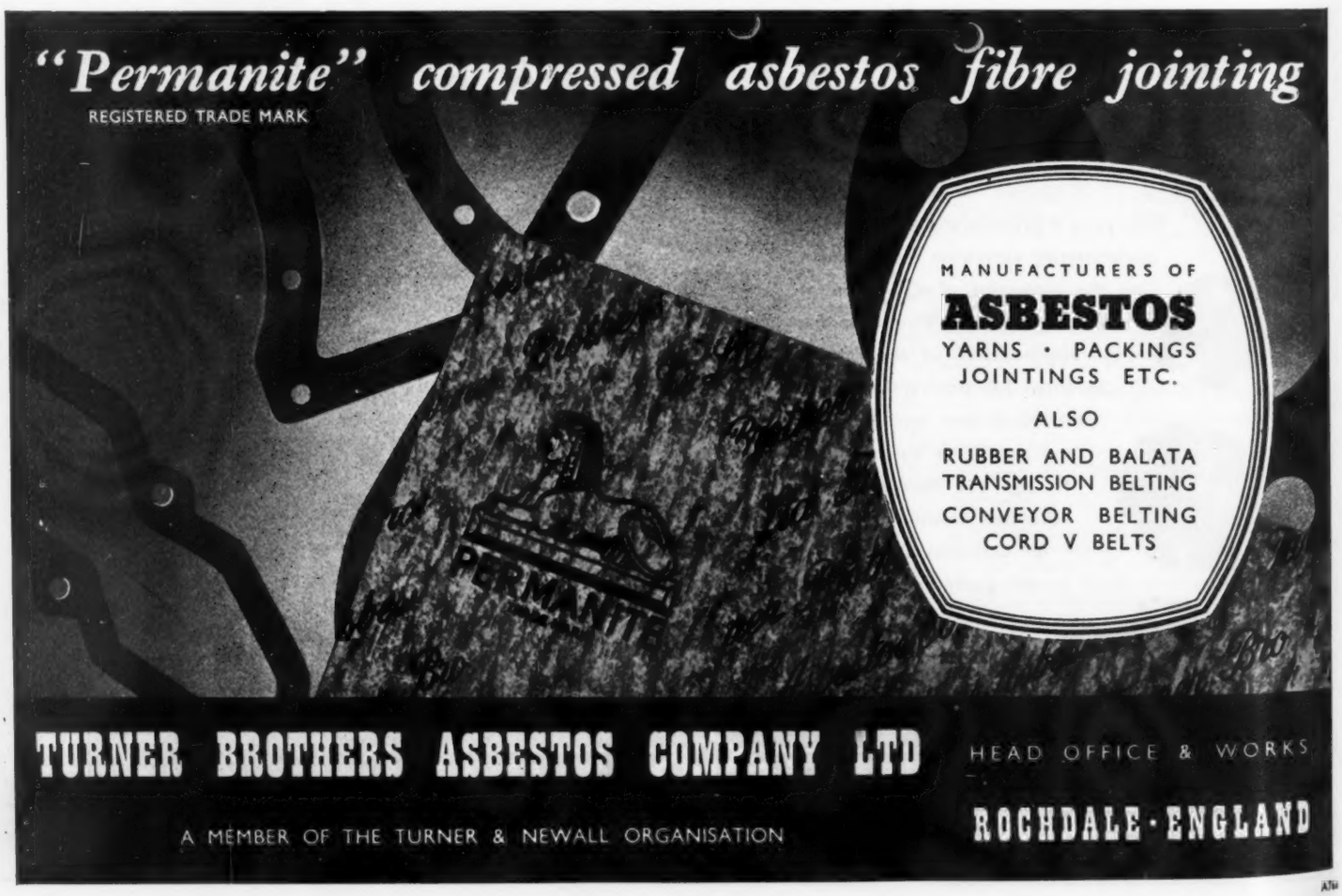
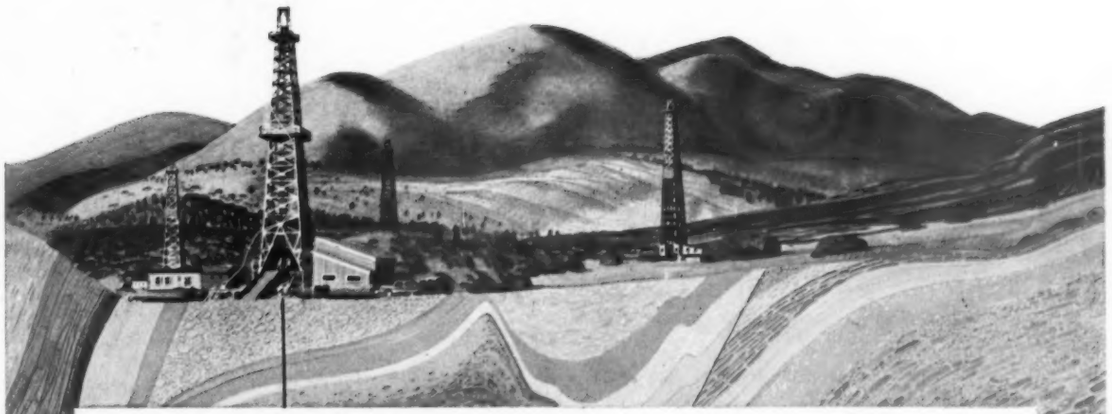
ADVERTISERS INDEX

(Advertising Agenies in Italics)

American Cyanamid Co. 71
Hazard Advertising Co.
American Petroleum Institute 73
Sullivan, Stauffer, Colwell & Bayles, Inc.
Attapulgus Clay Co. 20
Harris D. McKinney Organization
Axelson Manufacturing Co. 100
Heintz & Co.
E. B. Badger & Sons, Ltd. 27
Thames Advertising, Ltd.
Harold Cabot & Co.
Bechtel Corp. 13
Ryder & Ingram, Ltd.
Billington & Newton, Ltd. 92
Born Engineering Co. 79
Watts, Payne—Advertising, Inc.
British Ceca Co., Ltd. 103
British Ropes, Ltd. 90
D. J. Keymer & Co., Ltd.
California Texas Oil Co. 32
Cunningham & Walsh, Inc.
Chicago Bridge & Iron Co. I
Russell T. Gray, Inc.
Cooper-Bessemer Corp. 21
The Griswold-Eshleman Co.
Crane Packing, Ltd. 6
Ruddocks Advertising Agency
Curran Carbonizing & Engineering Co. 75
Ralph Smith Advertising Agency
Dikkers & Co. 3
N. V. Adrema
Drilling & Exploration Co., Inc. 31
E. I. du Pont de Nemours & Co., Inc. 35-38
Charles L. Rumrill & Co.
Ethyl Corp. 5
Batten, Barton, Durstine & Osborn, Inc.
Joseph Evans & Sons, Ltd. 83
Cogent Advertising Service, Ltd.
Fluor Corp. 23
Dozier Graham Eastman
Foster Wheeler Corp. 17-18
Albert Frank-Guenther Law, Inc.
Samuel Fox & Co. 30
Rowlinson-Broughton
General Controls 102
Hixson & Jorgensen, Inc.
General Electric Co. 15
Geophoto Services 12
Arthur G. Rippey & Co.
Gulf Oil Co. 24
Young & Rubicam, Inc.
Halliburton Oil Well Cementing Co. 42
Lannan & Sanders
G. A. Harvey & Co., Ltd. 9
Gordon Hargrove & Co.
Stuart Advertising Agency Ltd.
Hughes Tool Co. Third Cover
Foote, Cone & Belding
International General Electric Co. 15
Grant Advertising, Inc.
International Harvester Export Co. 14
McCann-Erickson Corp.
International Paints, Ltd. 89
Mayfair Advertising, Ltd.
M. O. Johnston Oil Field Export Corp. 91
Dozier Graham Eastman
M. W. Kellogg Co. 87-88
Gordon Baird Associates, Inc.
Lummus Co. 98-99
G. M. Basford Co.
Mather & Platt, Ltd. 26
Sidney F. Wicks, Ltd.
Arthur G. McKee & Co. 33
Meermans, Inc.
Lee C. Moore Corp. 19
Watts, Payne—Advertising, Inc.
Nordstrom Valve Division 2
The McCarthy Co.
Newman Hender & Co., Ltd. 103
Oil Industry Information Committee 73
Oxley Engineering Co., Ltd. 95
Rowlinson-Broughton
J. F. Pritchard & Co. 34
Carter Advertising Agency, Inc.
Pyrene & Co., Ltd. 81
Nelson Advertising Service, Ltd.
Republic Exploration Co. 39
White Advertising Agency
Rheem Manufacturing Co. 40
Foote, Cone & Belding
Schlumberger Overseas, S. A. 69
Rives, Dyke & Co.
Security Engineering Co. 7
The McCarthy Co.
Shell Oil Co. 77
J. Walter Thompson Co.
Socony Vacuum Oil Co. 101
Compton Advertising, Inc.
Southern Geophysical Co. 16
Cowan-Gilliam Advertising Agency
Spirax Manufacturing Co., Ltd. 89
Harry Dawson Advertisng
Standard Oil Co. (New Jersey) 8
McCann-Erickson, Inc.
Standard Vacuum Oil Co. 11
Sam J. Gallay Co.
Stewarts & Lloyds, Ltd. 85
H. Raymond Morgan
Stothert & Pitt, Ltd. 94
Tide Water Associated Oil Co. 93
Lennen & Mitchell, Inc.
Turner Brothers Asbestos Co., Ltd. 104
Rowlinson-Broughton
Unit Rig & Equipment Co. 97
Watts, Payne—Advertising, Inc.
United Geophysical Co. 84
Dozier Graham Eastman
United Steel Companies 25
Rowlinson-Broughton
Universal Oil Products Co. 28-29
Almon Brooks Wilder, Inc.
Henry Vogt Machine Co. 22
Farson & Huff, Advertising
Warren Petroleum Corp. Second Cover
Gibbons Advertising Agency, Inc.
G. & J. Weir 96
Richards & Thompson
Williams Brothers Corp. 4
Gibbons Advertising Agency, Inc.
Wyatt Metal & Boiler Works Fourth Cover
Wallace Davis & Co.
Youngstown Sheet & Tube Co. 10
The Griswold-Eshleman Co.





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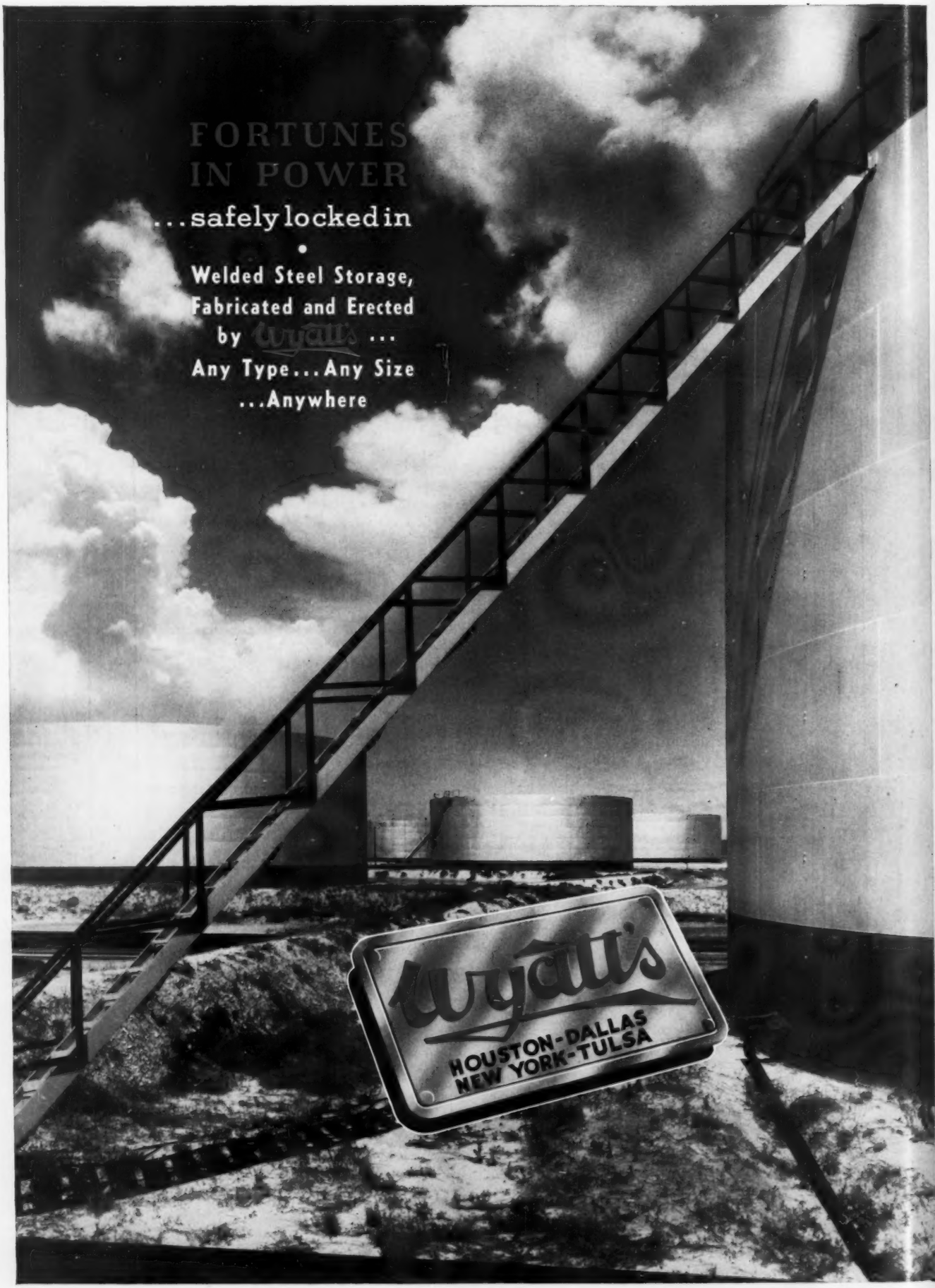
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